# Journal of the Royal Society of Arts

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## *FORTHCOMING MEETINGS*

MONDAY, 27TH APRIL, at 6 p.m. The second of three CANTOR LECTURES on '*Research in Textiles*', entitled '*Research in Cotton*', by J. J. Vincent, M.Sc., F.T.I., Professor of Textile Technology, Manchester College of Science and Technology.

MONDAY, 4TH MAY, at 6 p.m. The last of three CANTOR LECTURES on '*Research in Textiles*', entitled '*Research in Man-Made Fibres*', by J. R. Whinfield, C.B.E., M.A., F.R.I.C., F.T.I., of Imperial Chemical Industries Ltd.

WEDNESDAY, 6TH MAY, at 2.30 p.m. TRUEMAN WOOD LECTURE. '*The Growth and Scope of Industrial Design in the United States*', by Walter Dorwin Teague, Hon.R.D.I. Sir Alfred Bossom, Bt., LL.D., F.R.I.B.A., J.P., M.P., Chairman of Council of the Society, in the Chair. (The lecture will be illustrated by lantern slides.)

WEDNESDAY, 13TH MAY, at 2.30 p.m. '*The Work of the Historic Churches Preservation Trust*', by the Right Honble. the Earl of Euston, Deputy Chairman, Society for the Protection of Ancient Buildings. The Right Honble. Viscount Crookshank, P.C., C.H., Chairman, Executive Committee, Historic Churches Preservation Trust, in the Chair. (The paper will be illustrated by lantern slides.)

WEDNESDAY, 20TH MAY, at 2.30 p.m. '*Trade and the Bamboo Curtain*', by the Right Honble. the Earl of Verulam. Sir Alexander Grantham, G.C.M.G., late Governor of Hong Kong, in the Chair. (The paper will be illustrated by lantern slides.)

WEDNESDAY, 27TH MAY, at 2.30 p.m. '*The Development of the Port of London*', by Sir Leslie Ford, O.B.E., General Manager, Port of London Authority. John Hay, M.P., Parliamentary Secretary, Ministry of Transport and Civil Aviation, in the Chair. (The paper will be illustrated by a film.)

WEDNESDAY, 3RD JUNE, at 2.30 p.m. '*The Psychiatrist's Contribution to Medicine*', by D. Stafford-Clark, M.D., F.R.C.P., D.P.M. Sir Selwyn Selwyn-

Clarke, K.B.E., C.M.G., M.C., M.D., F.R.C.P., M.R.C.S., a Member of Council of the Society, in the Chair.

*Fellows are entitled to attend any of the Society's meetings without tickets (except where otherwise stated), and may also bring two guests. When they cannot accompany their guests, Fellows may give them special passes, books of which can be obtained on application to the Secretary.*

## *BENJAMIN FRANKLIN FELLOWS*

In order to commemorate Benjamin Franklin's lively and fruitful membership of the Society, the Council have recently been considering a new scheme for the election of a limited number of United States citizens of high standing as Benjamin Franklin Fellows. This scheme is now receiving active consideration from a small committee of American Fellows, presided over by General Sarnoff, and further announcements will be made in due course. In order, however, to show their confidence in the scheme, and in the committee which is developing it, the Council have decided to appoint the five members of the committee as the first Benjamin Franklin Fellows. They are as follows:

Brigadier-General G. L. Bliss
Dr. C. L. Jordan
Professor Simon Lissim
Mr. Irving S. Olds
Brigadier-General David Sarnoff

## *THE HISTORY OF THE SOCIETY*

A number of Fellows, particularly those who have been elected in recent years, may be unaware that, in addition to the current short prospectus of the Society's activities and development, there exists a full-length official history, published to mark the bicentenary year.

*The Royal Society of Arts* 1754–1954, by Derek Hudson and Kenneth W. Luckhurst, comprehends the whole story of the Society's diverse interests and achievements during its first two centuries. At the time of its publication, this work was widely noticed not only as admirably fulfilling this main purpose, but as a scholarly and readable contribution to the general history of the period it covers. The published price of the book, which is extensively illustrated, is 30*s*., but Fellows may obtain it from the Society's headquarters for 25*s*. a copy, post free.

## *EXHIBITION OF BURSARY DESIGNS*

As announced in the last issue of the *Journal*, the exhibition of winning and commended designs in the 1957 Industrial Art Bursaries Competition will be shown in the exhibition rooms on the first floor of the Society's extension premises (*which are reached from* 18 *Adam Street*) from Monday, 27th April, until Friday,

15th May. Special cards of admission are required for the opening at 4 p.m. on 27th April. Thereafter the hours of viewing are as follows: Mondays to Fridays, from 10 a.m. to 5.30 p.m.; Saturdays, from 10 a.m. to 12.30 p.m.

## *MEETING OF COUNCIL*

A meeting of Council was held on Monday, 13th April, 1959. Present: Sir Alfred Bossom (in the Chair); Mrs. Mary Adams; Sir Hilary Blood; the Honble. G. C. H. Chubb; Sir George Edwards; Mr. P. A. Le Neve Foster; Mr. E. Maxwell Fry; Mr. John Gloag; Sir Ernest Goodale; Mr. A. C. Hartley; Dr. R. W. Holland; Lord Latham; Mr. Edgar E. Lawley; Sir Harry Lindsay; Mr. Oswald P. Milne; Lord Nathan; Mr. Paul Reilly; Sir Philip Southwell; Mr. G. E. Tonge; Mr. Hugh A. Warren, and Miss Anna Zinkeisen; with Dr. K. W. Luckhurst (Secretary), Mr. G. E. Mercer (Deputy Secretary) and Mr. J. S. Skidmore (Assistant Secretary).

### ELECTIONS

The following candidates were duly elected Fellows of the Society:

Allen, Flight Sgt. Anthony Reginald, Melksham, Wilts.
Ash, Mrs. Ethel Dorothy, Woking, Surrey.
Bailey, Richard George, Coventry, Warwicks.
Best, Peter Edwin Wilson, A.I.B., Brighton.
Bing, Mrs. Betty Joyce, Margate, Kent.
Blishen, Lt.-Col. Henry Charles Adolphus, M.B.E., Arreton, Isle of Wight.
Broome, Reginald Henry, Ipswich.
Cass, John, Newcastle-upon-Tyne.
Christian, William Kenneth, M.A., Ph.D., Binghamton, New York, U.S.A.
Cooper, Miss Audrey, Shrewsbury.
Crispin, Donald Alan, B.Sc., West Byfleet, Surrey.
Cullen, Mrs. Marie, St. Albans, Herts.
Dunn, Ronald Frederick, Greenford, Middx.
Edwards, Mrs. Ngareta Ann, N.D.D., Exeter.
Endicott, Mrs. Ellice, Beverly Farms, Mass., U.S.A.
Farquhar, Edward George, Bedlington, Northumberland.
Faulkner, Herbert Charles, London.
Gallagher, Arthur Joseph, Wirral, Cheshire.
Godden, Geoffrey Arthur, Worthing, Sussex.
Graham, Kenneth Leslie, London.
Green, Gerald John, Cheltenham, Glos.
Hill, Wilfred, Portishead, Somerset.
Hilton, Jack Hamer, Oldham, Lancs.
Ikramullah, Begum Shaista S., B.A., Ph.D., Pakistan.
Jeater, Mrs. Joyce Marjorie, Moshi, Tanganyika.
John, Gnanapragasam, Jaffna, Ceylon.
Johnstone-Hall, James George, B.Sc.(Eng.), M.I.Mech.E., Bromley, Kent.
Laws, Eric John, Nottingham.
Linnett, Miss Theresa Irene, Birkenhead, Cheshire.
Lloyd-Davies, Idris, Torquay, Devon.

Longley, Major Walter, Folkestone, Kent.
Lucas, Alexander Burton, B.A., B.Paed., LL.D., London, Ontario, Canada.
Mayorcas, Elie, F.R.I.B.A., London.
McKay, Eric Bruce, Eastbourne, Sussex.
McOnegal, Edward Alan, A.R.I.B.A., Maidstone, Kent.
Murdoch, George Stewart, Haxby, Yorks.
Newbury, Bertram, Enfield, Middx.
Norwood, Charles Roland, M.I.Mech.E., Hebden Bridge, Yorks.
Pinder, Thomas Henry, Reigate, Surrey.
Poppe, Bogumil Alexander, Banbury, Oxon.
Ring, Brian, London.
Robertshaw, Alan Taylor, Wakefield, Yorks.
Salam, Idris bin Haji Abdul, Kuala Lumpur, Malaya.
Schiffmann, Ernst Gustav, Oswestry, Shropshire.
Scarbrough, Derek, Crawley, Sussex.
Smith, Robert Brian, Halstead, Essex.
Sugden, John Kenneth, Bingley, Yorks.
Sutton, William Donaldson, B.A., B.Paed., London, Ontario, Canada.
Stephens, Dennis Russell, M.A., Basingstoke, Hants.
Terry, William Earle, B.A., B.Paed., M.Mus., London, Ontario, Canada.
Thompson, Eric Copley, Poynton, Cheshire.
Turrill-Turrill, David William, Horsham, Sussex.
Ullyett, Kenneth, Hampton Court, Middx.
Vayana, Nunzio, Ogunquit, Maine, U.S.A.
Waller, Alan Roy, Reading, Berks.
Ward, Dennis, Orpington, Kent.
Wardle, John, Cottingham, Yorks.
Whiston, James Sydney, Littleover, Derby.
Williams, George Minty, London.

The following candidates were duly elected Associate Members of the Society as Industrial Art Bursaries winners in 1958:

Carmichael, Miss Geraldine Ann, N.D.D., Liverpool, Lancs.
Garwood, Miss Karen, Shoreham-by-Sea, Sussex.
Payne, Anthony Norman, Waltham Abbey, Essex.
Probst, Graham Keith, Claygate, Surrey.
Stokes, John Ralph, Borehamwood, Herts.
Williams, Miss Sadie Carolin, Stockport, Cheshire.
Widdowson, Timothy Penn, Wendover, Bucks.
Wolf, Leslie, Newcastle-upon-Tyne.

The following was also elected an Associate Member:

Dando, Leonard John Rudolph, London.

The following were admitted as Institutions in Union with the Society:

The Building Centre Dublin Ltd., Dublin, Eire.
Consumers' Association Ltd., London.

## ALBERT MEDAL FOR 1959

Further consideration was given to the award of the Society's Albert Medal for 1959.

CHRISTMAS CARD FOR 1959

A subject was decided upon for the Society's 1959 Christmas Card, and Miss Anna Zinkeisen undertook to paint a picture for this purpose.

SCIENCE AND INDUSTRY COMMITTEE

It was decided to arrange a Conference, to be held in the late autumn at the Society's House, in connection with the third and final publication of the Science and Industry Committee.

PAXTON MEMORIAL TRUST

Consideration was given to a scheme under the Paxton Memorial Trust for the award of an annual bursary to a promising student of horticulture.

EXAMINATIONS

It was reported that 66,551 entries had been received for the Whitsun series of examinations, an increase of 10,892 over the corresponding figure for 1958.

ANNUAL GENERAL MEETING

It was decided that the Annual General Meeting should be held on Wednesday, 1st July, at 3 p.m.

OTHER BUSINESS

A quantity of financial and other business was transacted.

# WOMEN AS WRITERS

*The Peter Le Neve Foster Lecture by*

*SYLVIA TOWNSEND WARNER,*

*delivered to the Society on Wednesday, 11th February, 1959, with Leonard Woolf in the Chair*

THE CHAIRMAN: It is a great honour to have been asked to take the Chair for Sylvia Townsend Warner to-day. One of the few famous statesmen who seem to me to be worthy of some admiration was Pericles, but he is reputed to have said, on one occasion, 'As far as women are concerned I have only one thing to say; and that is, the less we hear of them, whether for good or for evil, the better'. That may appear an extraordinarily tactless thing to recall when we are gathered together to hear a poet and a novelist of the very highest quality who happens also to be a woman. But I quoted that saying because I feel quite certain that if Pericles happened to be here to-day he would have agreed that he was quite wrong and that his words applied really not to women, but to Chairmen.

*The following lecture was then delivered.*

## THE LECTURE

When I received this invitation to lecture to the Royal Society of Arts on 'Women as Writers' (and here let me express my thanks to the responsible Committee, and to the shade of Peter Le Neve Foster, whose family founded the lectureship, and to my Chairman)—when I received this invitation, it was the invitation that surprised me. The choice of subject did not. I am a woman writer myself, and it never surprises me. Even when people tell me I am a lady novelist, it is the wording of the allegation I take exception to, not the allegation itself. One doubt, it is true, crossed my mind. It was inevitable that I should remember a book called *A Room of One's Own*, by Virginia Woolf. What had I to add to that? But *A Room of One's Own*, I thought, is not so much about how women write as about how astonishing it is that they should have managed to write at all. As they have managed to, there might still be something I could add. But then I reread my invitation, and became the prey of uneasiness. Women as Writers. *Women* as Writers. Supposing I had been a man, a gentleman novelist, would I have been asked to lecture on Men as Writers? I thought it improbable.

Here was an implication I might or might not resent. Here, at any rate, was an obligation I couldn't dodge.

It would appear that when a woman writes a book, the action sets up an extraneous vibration. Something happens that must be accounted for. It is the action that does it, not the product. It is only in very rare, and rather non-literary instances, that the product—*Uncle Tom's Cabin*, say, or the *Memoirs of Harriet Wilson*—is the jarring note. It would also appear that this extraneous vibration may be differently received and differently resounded. Some surfaces mute it. Off others, it is violently resonated. It is also subject to the influence of

climate, the climate of popular opinion. In a fine dry climate the dissonance caused by a woman writing a book has much less intensity than in a damp foggy one. Overriding these variations due to surface and climate is the fact that the volume increases with the mass—as summarized in Macheath's Law:

> One wife is too much for most husbands to hear
> But two at a time sure no mortal can bear.

Finally, it would appear that the vibration is not set up until a woman seizes a pen. She may invent, but she may not write down.

Macheath's Law explains why the early women writers caused so little alarm. They only went off one at a time. If a great lady such as Marie de France chose to give her leisure to letters instead of embroidery, this was merely a demonstration that society could afford such luxuries—an example of what Veblen defined as Conspicuous Waste. No one went unfed or unclothed for it. Nor could she be held guilty of setting a bad example to other women, since so few women were in a position to follow it. So things went on, with now and then a literate woman making a little squeak with her pen, while the other women added a few more lines to Mother Goose (about that authorship, I think there can be no dispute). It was not till the retreat from the Renaissance that the extraneous vibration was heard as so very jarring. By then, many women had learned to read and write, so a literate woman was no longer an ornament to society. Kept in bounds, she had her uses. She could keep the account books and transcribe recipes for puddings and horse pills. But she must be kept within bounds; she must subserve. When Teresa of Avila wrote her autobiography, she said in a preface that it had been written with leave, and 'in accordance with my confessor's command'. True, she immediately added, 'The Lord himself, I know, has long wished it to be written'—a sentiment felt by most creative writers, I believe; but the woman and the Lord had to wait for permission.

The French have always allowed a place to Conspicuous Waste, it is one of the things they excel at; and Mme. de La Fayette rewarded this tolerance by giving France the first psychological novel, *La Princesse de Clèves*. But Molière was probably a surer mouthpiece of public opinion when he made game of literary ladies. It is more damning to be shown as absurd than to be denounced as scandalous. It is more damning still to be thought old-fashioned. Margaret Countess of Newcastle was derided not only as a figure of fun but as a figure out of the lumber-room. (Much the same condemnation fell on Lady Murasaki, a most eminent woman writer, whose nickname in the Japanese court of the early eleventh century was Dame Annals.) In eighteenth-century England, a woman of fashion wrote at her peril (I doubt if Pope would have laid so much stress on Lady Mary Wortley Montagu being dirty if she had not been inky). A woman who wrote for publication—by then, a fair number did—sank in the social scale. If she wrote fiction, she was a demirep. If she wrote as a scholar, she was a dowdy. However, as men of letters had also gone down in the world, writing women gained more than they lost. They gained companionship, they approached a possibility of being judged on their merits by writers of the opposite sex.

Too much has been made of Dr. Johnson's opinion of women preachers, not enough of the fact that Mrs. Chapone and Elizabeth Carter contributed to *The Rambler*, nor of his goodwill towards Mrs. Lennox, and the hot apple pie he stuck with bay leaves in her honour. In the case of Fanny Burney, Johnson showed more than goodwill. He showed courage. Fanny Burney was his friend's daughter, and a virgin. And Fanny Burney had written a novel. Not even a romance. A novel.

The speed with which women possess themselves of an advantage is something astonishing. Such quantities of virtuous women turned to novel writing that Jane Austen was able to pick and choose among them, to laugh at Ann Radcliffe and Mary Brunton, to admire Miss Edgeworth. It was an Indian summer, the last glow of the Age of Reason. Jane Austen could inscribe her title-page with that majestic, *By a Lady*. The Brontë sisters, not so. They were born too late. The barometer had fallen, the skies had darkened. They grew up in an age which had decided that women had an innate moral superiority. As almost everything was a menace to this innate moral superiority, it was necessary that women should be protected, protected from men, protected from life, protected from being talked about, protected from Euclid—Mary Somerville the mathematician has recorded how hard put to it she was to expose herself to Euclid—protected above all from those dangerous articles, themselves. You couldn't have women dashing their pens into inkpots and writing as if they knew about life and had something to say about it. Determined to write and to be judged on the merit of their writing, women put on men's names: Aurore Dudevant became George Sand, and Mary Ann Evans, George Eliot, and Emily Brontë consented to the ambiguity of Ellis Bell.

I think I can now venture a positive assertion about women as writers. It is a distinguishing assertion; if I were talking about Men as Writers I could not make it. Women as writers are obstinate and sly.

I deliberately make this assertion in the present tense. Though a woman writing to-day is not hampered by an attribution of innate moral superiority, she has to reckon with an attribution of innate physical superiority; and this, too, can be cumbersome. There is, for instance, bi-location. It is well known that a woman can be in two places at once; at her desk and at her washing machine. She can practise a mental bi-location also, pinning down some slippery adverb while saying aloud, 'No, not Hobbs, Nokes. And the address is 17 Dalmeny Crescent'. Her mind is so extensive that it can simultaneously follow an intricate train of thought, remember what it was she had to tell the electrician, answer the telephone, keep an eye on the time, and not forget about the potatoes. Obstinacy and slyness still have their uses, although they are not literary qualities.

But I have sometimes wondered if women are literary at all. It is not a thing which is strenuously required of them, and perhaps, finding something not required of them, they thank God and do no more about it. They write. They dive into writing like ducks into water. One would almost think it came naturally to them—at any rate as naturally as plain sewing.

Here is a non-literary woman writing in the nineteenth century. She wrote under her own name, for her sex was already notorious.

> There were three separate registers kept at Scutari. First, the Adjutant's daily Head-Roll of soldiers' burials, on which it may be presumed that no one was entered who was not buried, although it is possible that some may have been buried who were not entered.
>
> Second, the Medical Officer's Return, in regard to which it is quite certain that hundreds of men were buried who never appeared upon it.
>
> Third, the return made in the Orderly Room, which is only remarkable as giving a totally different account of the deaths from either of the others.

I should like to think that Florence Nightingale's work is not yet done. If it could be set as a model before those who write official reports, the publications of Her Majesty's Stationery Office might grow much leaner, much time and money might be saved. But this is by the way.

Here is another, writing in the seventeenth century:

> Take a pint of cream, three spoonfuls of rice flour, the whites of three eggs well beaten, and four spoonfuls of fine sugar. Stir these well into your cream cold; then take a few blanched almonds and beat them in a mortar with two spoonfuls of water, then strain them into your cream and boil it till it comes from the skillet. Then take it up and put in two spoonfuls of sack, and wet your cups with sack and put in your custard, and let it stand till it is cold.

From a cookery book, as you will have realized—but a piece of tight, clear, consecutive writing.

Here is a woman writing from Norwich in July, 1453:

> And as for tidings, Philip Berney is passed to God on Monday last past with the greatest pain that ever I saw man; and on Tuesday Sir John Heveningham went to his church and heard three masses and came home never merrier; and said to his wife that he would go say a little devotion in his garden and then dine; and forthwith he felt a fainting in his leg and slid down. This was at nine of the clock and he was dead ere noon.

Here is another Norfolk woman, writing, or possibly dictating, towards the close of the previous century:

> And after this I saw God in a Point—that is to say, in my understanding; by which I saw he is in all things. I beheld and considered, seeing and knowing in sight, with a soft dread, and thought: What is sin?

I really have not cheated over these examples. The two notable women, the two women of no note, I chose them almost at random, and went to their writings to see what I would find. I found them alike in making themselves clear.

As far as I know, there is only one certain method of making oneself clear, and that is, to have plainly in mind what one wishes to say. When the unequivocal statement matches itself to the predetermined thought and the creative impulse sets fire to them, the quality we call immediacy results. Immediacy has borne other names, it has even been called inspiration—though I think that is too large a term for it. But immediacy has this in common with inspiration, that where it is present, the author becomes absent. The writing is no longer propelled by

the author's anxious hand, the reader is no longer conscious of the author's chaperoning presence. Here is an example; it is a poem by Frances Cornford:

> The Cypriot woman, as she closed her dress,
> Smiled at the baby on her broad-lapped knee,
> Beautiful in a calm voluptuousness
> Like a slow sea.*

One does not feel that the woman has been written about. She is there.

Women as writers seem to be remarkably adept at vanishing out of their writing so that the quality of immediacy replaces them. Immediacy is the word in *La Princesse de Clèves*, that masterpiece of emotion laced up in the tight embroidered bodice of court dress. Madame de Clèves' heart is laid open before us, and we hang over it; not even pity is allowed to intervene between us and the demonstration. Immediacy is the word when Jane Austen keeps a bookful of rather undistinguished characters not only all alive at once but all aware of each other's existence. In *Wuthering Heights* immediacy makes a bookful of almost incredible characters fastened into a maddeningly entangled plot seem natural and inevitable, as if it were something familiar to us because of a dream. When the goblins fasten on Lizzie and press the fruit against her clenched teeth; when Orlando finds the man in Mrs. Stewkley's room, the man who turned his pen in his fingers, this way and that; and gazed and mused; and then, very quickly, wrote half a dozen lines—and no more need be said, with our own eyes we have looked on William Shakespeare; when Murasaki's Genji takes Yūgao to the deserted house where the ghost steals her away from him; when, at the close of Colette's *La Chatte*, the girl looks back from the turn of the avenue and sees the cat keeping a mistrustful eye on her departure and the young man playing, deftly as a cat, with the first-fallen chestnuts, it is not the writer one is conscious of. One is conscious of a happening, of something taking place under one's very nose. As for Sappho, I cannot speak. She rises in my mind like a beautiful distant island, but I cannot set foot on her because I haven't learned Greek. But I have been assured that immediacy is the word for Sappho.

While all these splendid examples were rushing into my mind, I realized that a great many examples which could not be called splendid were accompanying them: that when the gust of wind flutters the hangings and extinguishes the solitary taper and Mrs. Radcliffe's heroine is left in darkness, it is a darkness that can be felt; that in George Sand's writing, for all its exploitation and rhetoric, George Sand may suddenly be replaced by the first frost prowling under cover of night through an autumn garden; that the short stories of Mary Wilkins, a New England writer of the last century whose characters appear to be made of lettuce, can remain in one's mind and call one back to a re-reading because one remembers a queer brilliant verisimilitude, the lighting of immediacy.

There is, of course, George Eliot. She makes herself admirably clear and her mind, such a fine capacious mind, too, is stored with things she wishes to say; but in her case, immediacy does not result. We remember scenes and characters, but do they ever haunt us? She dissects a heart, but something intervenes between

* 'Behind a Greek Restaurant', reproduced by permission of The Cresset Press Ltd.

us and the demonstration—the lecturer's little wand. There is a class of women writers, praiseworthily combining fiction with edification, and among them is Mrs. Sherwood of *The Fairchild Family*, Mrs. Gatty of *Parables from Nature*, Mrs. Trimmer . . . it seems to me that George Eliot insisted upon being a superlative Mrs. Trimmer.

Still, George Eliot apart—a considerable apart—I think one might claim that this quality of immediacy, though common to either sex, is proportionately of more frequent occurrence in the work of women writers. And though it is impossible in judging the finished product to pronounce on which pages were achieved with effort, which came easily, the fact that even quite mediocre women writers will sometimes wear this precious jewel in their heads seems to indicate that it is easier for a woman to make herself air and vanish off her pages than it is for a man, with his heavier equipment of learning and self-consciousness. Perhaps this is really so, and for a reason. Suppose, for instance, there was a palace, which you could only know from outside. Sometimes you heard music playing within, and the corks popping, and sometimes splendid figures came to an open window and spoke a few words in a solemn chanting voice; and from time to time you met someone who had actually been inside, and was carrying away under his arm—it was always a man—a lute or a casket or the leg of a turkey. And then one day you discovered that you could climb into this palace by the pantry window. In the excitement of the moment you wouldn't wait; you wouldn't go home to smooth your hair or borrow your grandmother's garnets or consult the Book of Etiquette. Even at the risk of being turned out by the butler, rebuked by the chaplain, laughed at by the rightful guests, you'd climb in.

In something of the same way, women have entered literature—breathless, unequipped, and with nothing but their wits to trust to. A few minutes ago, or a few centuries ago, they were writing a letter about an apoplexy, or a recipe for custard. Now they are inside the palace, writing with great clearness what they have in mind to say—for that is all they know about it, no one has groomed them for a literary career—writing on the kitchen table, like Emily Brontë, or on the washstand, like Christina Rossetti, writing in the attic, like George Sand, or in the family parlour, protected by a squeaking door from being discovered at it, like Jane Austen, writing away for all they are worth, and seldom blotting a line.

Do you see what we are coming to?—I have put in several quotations to prepare you for it. We are coming to those other writers who have got into literature by the pantry window, and who have left the most illustrious footprints on the windowsill. It is a dizzying conclusion, but it must be faced. Women, entering literature, entered it on the same footing as William Shakespeare.

So if women writers have what might appear an unfairly large share of the quality of immediacy which is sometimes called inspiration—and in the case of Shakespeare we all agree to call it so—it is not, after all, original in them—like sin. It derives from their circumstances, not from their sex. It is interesting to see what other qualities, also deriving from circumstance, the circumstance of entering literature by the pantry window, they share with Shakespeare.

I can think of several. One is their conviction that women have legs of their own, and can move about of their own volition, and give as good as they get. Lady Macbeth, and Beatrice, and Helena in *All's Well*, could almost be taken for women writers' heroines, they are so free and uninhibited, and ready to jump over stiles and appear in the drawing-room with muddy stockings, like Lizzie Bennet.

Another pantry window trait is the kind of workaday democracy, an ease and appreciativeness in low company. It is extremely rare to find the conventional comic servant or comic countryman in books by women. A convention is a *pis-aller*, a stopgap where experience is lacking. A woman has to be most exceptionally secluded if she never goes to her own back door, or is not on visiting terms with people poorer than herself. I have said before—but as the remark has only appeared in Russian I can decently repeat myself—Emily Brontë was fortunate in being the daughter of a clergyman, because the daughter of a clergyman, with her duty of parish visiting, has wonderful opportunities to become acquainted with human passions and what they can lead to. Another trait in common is a willing ear for the native tongue, for turns of phrase used by carpenters, gardeners, sailors, milliners, tinkers, old nurses, and that oldest nurse of all, ballad and folklore. Just as Mme. de Sévigné was always improving her French by picking up words and idioms from her tenants at Les Rochers, Colette listened to every trade, every walk in life, and kept dictionaries of professional terms beside her desk—while Edith Sitwell's poetry reaches back through centuries of English poetical idiom to *Nuts in May* and Mother Goose.

These traits, as you will have noticed, are technical assets. They affect presentation, not content. Their absence may be deadening, but their presence does not make their possessor any more eligible to be compared with Shakespeare. The resemblance is in the circumstances. Women writers have shared his advantage of starting with no literary advantages. No butlers were waiting just inside the front door to receive their invitation cards and show them in. Perhaps the advantage is not wholly advantageous; but circumstances do alter cases. It was not very surprising that young Mr. Shelley should turn to writing; it was surprising that young Mr. Keats did, and his poetry reflects his surprise, his elation. It is the poetry of a young man surprised by joy. So is the poetry of John Clare. But though the male entrants by the pantry window possess the quality of immediacy just as women writers do, are at ease in low company and in the byways of their native language, they do not employ these advantages with the same fluency—I hesitate to use the word *exploit*; I will say, they are not so much obliged to them. I see a possible explanation for this, which I will come to presently.

But first I must come to the present day, when women, one might think, have so well established themselves as writers that the extraneous vibration must be hushed, and the pantry window supplanted as an entrance to literature by the Tradesman's Door. No woman writer should despise the Tradesman's Door. It is a very respectable entrance, the path to it was first trodden by Mrs. Aphra Behn, and many women have trodden it since, creditably and contentedly

too. I should be failing my title if I did not remind you that we now have women newspaper reporters working in such vexed places as Cyprus—a signal advance. Yet, when we use the term *hack-writer*, we still feel that it must apply to a man; that a woman writer is once and for always an amateur. In the same spirit, if she happens to make a great deal of money by a book, well and good, it is one of those lucky accidents that happen from time to time, no one is the worse for it, and she is unexpectedly the better. But if she earns her living by her pen, we are not so ready to accept the idea. If we are polite enough to dissemble our feelings we say that it is a pity that with so much talent she should be reduced to this kind of thing. If we are candid and pure-souled, we say it's outrageous and that she ought to become a hospital nurse. If she marries—again it's a pity—a polite pity that she will have to give up her writing. So much pity is ominous.

And in fact, the vibration may start up at any moment. Macheath's Law still holds; not for numbers, perhaps, but for area. It is admitted that women may write very nearly what they please, just as, within limits, they may do what they please: though I suppose it will be a long time before they can enter the priesthood or report football matches on the B.B.C. But this liberty is zoned. It applies to women belonging to the middle classes. You know those shiny papers one reads in waiting-rooms, and how, every week, they show a photograph of a woman of the upper classes, with a little notice underneath. One has just come out. One has recently married. One wins prizes with her Shetland ponies, another has a charming pair of twins, another is an M.F.H. But despite Edith Sitwell and Dorothy Wellesley, one does not expect to read below the photograph that the lady is a poet. Take it a step higher. Suppose that a royal princess would not tear herself from the third act of her tragedy in order to open a play-centre. People would be gravely put out, especially the men who had been building the play-centre, men who have taught their wives to know their place, and who expect princesses to be equally dutiful.

A working-class woman may be as gifted as all the women writers I have spoken of to-day, all rolled into one; but it is no part of her duty to write a masterpiece. Her brain may be teeming, but it is not the fertility of her brain she must attend to, perishable citizens is what her country expects of her, not imperishable Falstaffs and Don Quixotes. The Lord himself may long have wished for her books to be written; but leave has yet to be granted. Apart from one or two grandees like Mme. de La Fayette, women writers have come from the middle class, and their writing carries a heritage of middle-class virtues; good taste, prudence, acceptance of limitations, compliance with standards, and that typically middle-class merit of making the most of what one's got—in other words, that too-conscious employment of advantages which I mentioned a few minutes ago, and which one does not observe in Clare, or Burns, or Bunyan. So when we consider women as writers, we must bear in mind that we have not very much to go on, and that it is too early to assess what they may be capable of. It may well be that the half has not been told us: that unbridled masterpieces, daring innovations, epics, tragedies, works of genial impropriety—all the things

that so far women have signally failed to produce—have been socially, not sexually, debarred; that at this moment a Joan Milton or a Françoise Rabelais may have left the washing unironed and the stew uncared for because she can't wait to begin.

THE CHAIRMAN: I have never believed in the truth of any generalization—more especially generalizations about women and about men. But the generalizations which Miss Townsend Warner has given us this afternoon seem to have been both true and brilliant; and I believe that if Pericles had been here to-day he would have agreed that his original saying was nonsense.

*A vote of thanks to the Lecturer was carried with acclamation and, another having been accorded to the Chairman upon the proposal of Dr. R. W. Holland, the meeting then ended.*

# THE FUTURE OF NASH TERRACES

*A Symposium*

*held at the Society's House on Wednesday, 4th March, 1959, with Sir Thomas Bennett, K.B.E., F.R.I.B.A., in the Chair*

## INTRODUCTION

THE CHAIRMAN: To-day we expected to hear a paper by Mr. Richard Davies on certain aspects of the conversion of the buildings which we know as the Nash Terraces. Unfortunately Mr. Davies is ill and quite unable to come; and we shall not have the pleasure of listening to a paper by him. What we have decided to do instead this afternoon is to institute a discussion which, we hope, will cover different aspects of the problem which have been brought to light.

The problem of preserving the Nash Terraces has actually reached a point at which physical work is being considered and must in the not too distant future be carried out. So we are going to try and consider this problem as a whole.

In order that we may be able clearly to understand what this means, let me begin by reminding you of what the Nash Terraces really are at the present moment: one of the most unified and complete conceptions, in respect of both planning and design, which we possess in London. In the Nash Terraces, and in what used to be called the Marylebone Park, we have not only a very fine piece of town planning in the heart of our city, but town planning carried out in three dimensions. The buildings are of a high standard in respect of mass and design, and a very considerable variety of detail has been achieved within the original concept. This combination is all too rarely found in the architecture which remains to us. Elsewhere we have many individual buildings, many fine streets. But here is a large area of many acres which in general appearance has architectural lines: in the form of the roads which surround it, in the approaches to it and in the buildings which have been erected on it.

For many years those buildings stood as they were intended to stand, as the homes of people of substance. The Crown took a pride in preserving their general appearance, the individual inhabitants were proud of their individual houses, and the general public of England as a whole, and of London in particular, drove round that Park for a hundred years or more enjoying one of the really great sights of this country. The architecture belonged to a period when the aristocratic element entered into design, when some classic tradition still remained, yet with sufficient alteration in the classic form to give it an intrinsic interest of its own. We shall hear this afternoon something about the features of the different blocks; something perhaps about the detail, that in many cases is not all that could be desired; something perhaps about the great architect who designed them—a personality in himself, a man who took an interest in the financial as well as in the architectural aspect of his work and who obviously possessed the power, in spite of obstacles (and we must assume they were many)

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*Chester Terrace, south-west entrance (photograph taken in 1958)*

of carrying through what he set out to do, and of finally achieving something which had had an unmistakable impact on his own time and was of a sufficiently high standard to continue to make an impact on many generations that followed.

Now roughly 150 years later we are faced with the problem of preservation in some form. We have had commissions, discussions, newspaper articles; we have had expressions of all sorts of views—and have finally decided that the Nash Terraces must be preserved.

In the detachment of a committee room in a government office it is fairly simple to make a decision of principle of that kind, yet it should be remembered that these buildings have already had a life of upwards of one hundred years. For a great many buildings that is a sufficient life; and these were not always so well constructed in the first place. They are liable, like all buildings, to dry-rot, to worm, to the falling-off of plaster, to the failure of beams, to all kinds of physical decay which cannot be allowed to go unchecked for another hundred years.

We are also faced with the fact that social and economic conditions have changed. We now want to live in centrally-heated houses—and many of us have had experience of the effect of introducing a temperature of 70 degrees into buildings which have endured for many years without any temperature

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*Chester Terrace (photograph taken before 1941)*

approaching that. Social conditions have brought about needs quite at variance with the type of planning used in these buildings. If these are to be flats we need large numbers of small rooms like bathrooms and kitchens, and we normally expect such rooms to have natural ventilation. You cannot pierce the façades of these terraces with innumerable small windows or even with air bricks; yet many people still object to the artificially ventilated room. If you introduce that kind of physical amenity, which is a contribution to the comfort of the inhabitants, then quite clearly you have to face the high initial cost, and the considerable annual costs of upkeep; and you run the risk that the amenity you have introduced is itself helping to destroy the very buildings you set out to preserve.

We cannot be unconscious of the fact that various methods of treatment are possible in restoring these terraces. There is the method by which you divide vertically and make the best use of the rear faces of the building for the more difficult parts of planning, reserving the great outlook on the park for the more majestic living-rooms. We have the method of horizontal division, by which we can join several properties together, making holes in party walls, and doing other things of that sort which will give us a flat dwelling, extending over one, two, three or more of what were originally separate houses. Some of these rooms are under porticos, those at the top are in the form of attics, and we have presumably to produce an economic answer to that problem. We have the possibility of taking away all the rear portions of the buildings—where planning is no

longer in accordance with ideas of to-day—and somehow or other fastening the façades on to entirely new buildings behind. We have to consider whether the whole risk and cost of holding up buildings already 120 years old should properly be borne by the nation, or should be passed on to the developer—whether it should become for a period of years the responsibility of the person who sinks his money into the development. It must be decided whether those buildings are capable, with any kind of treatment, of lasting for another hundred years, or whether this decision to retain them in principle must be limited to some period like thirty years or fifty years or some other much shorter period. Then there is the practical possibility which arises if the Crown wishes to pass on its liability for maintenance: can you find people prepared to lay down the capital sums and carry the maintenance risks? You have perhaps, even now, in case physical problems should prove overwhelming, to decide whether you can hope to preserve the whole of the Nash Terraces, or whether you may be forced to pick out two or three fine examples only, and allow the remainder to be reconstructed by modern architects.

At this particular stage of architectural progress, have we the right architects for the job? We have to run a measure of risk with all architects. They are a dangerous race of people, apt, if they are true artists, to think that their ideas are the only right ones in spite of what anybody else may say. You have to give play to their imagination.

There may be other considerations also. For example, there are some streets like Albany Street which are mean streets. If you were to drive holes through the terraces as a way of dividing the buildings and making open spaces, the result would be wonderful views of Regent's Park at various points in Albany Street, which in themselves would be a great further contribution to the planning of this part of London. On the other side, in Park Street, there is a row of mean shops, almost contemporary, and opening up views which, from that side of the Park, would have very great advantages for those people who drive from Baker Street to St. John's Wood. We have to consider whether it is right to continue to develop a thin façade on that side of the Park and leave this hinterland of beautiful open space and wonderful trees—great stretches of grassland in the heart of the metropolis—unseen by the thousands of people who pass up those streets.

In the whole of this development there is a wide range of possible usages. St. John's Wood, for example, has a relatively high grade of residences, flats or houses, with proximity to the West End of London, and the convenience of living on that side of the Park. Adjacent to it is a certain business use. Is it right that a section of the Park should become the economic basis upon which you build the preservation of the remainder, and should you give some portion of the Baker Street area over to office buildings, or some remunerative type of development, in order that that development may pay for the undoubtedly costly responsibility of preserving the remainder? At the other end of this great range of buildings lies Camden Town, with its relatively mean streets. In carrying out such a redevelopment we need a social approach to these problems, whereby

the margin which can be obtained from commerce or from the well-to-do should be used as a partial subsidy for giving the same amenity to people at the other end of the Park to enjoy. It is extremely difficult to divorce our minds from the economic or the social or the practical aspects which preservation entails. There must always be a doubt as to whether it is right to carry out a great preservation scheme unless the resulting buildings are useful buildings in the proper sense of the word.

These, it seems to me, are some of the practical problems that arise in considering this proposition, and we are going to begin the discussion with contributions from three speakers who have knowledge of their respective sides of the subject. Mr. MacGregor will remind us of the physical appearance and past history of the Nash Terraces. Mr. Osman will tell us of the problems of preserving the property as it is. Mr. Maxwell Fry will tell us that he thinks it doubtful whether we are doing the right thing at all.

## SYMPOSIUM

MR. J. E. M. MACGREGOR, F.S.A., F.R.I.B.A.: First of all, I will say something about what the Terraces and the whole of Regent's Park mean to me as a lifetime Londoner. London is a city which has developed from a series of small units growing together. The mere position of the Thames, dividing the Channel Ports from the great part of England above, has meant that the Thames had to be crossed; and London being the lowest point at which, from Roman times onwards, it was possible to cross, the township had a unique importance. As the problem of crossing the river forced itself upon the people, the natural development took place along the river banks wherever the sweep of the tide made a foreshore. Therefore we got a series of small townships which all nestled along the river bank. Growing up at the same time were the towns on the hills of Hampstead, Highgate, and so forth. Regent's Park is not the centre of a growing unit of townships, but the link between them; it is essentially an enclosing of the swamps and meadows of land lying between the towns on the river and the towns on the hill which gives the Park its unique character. The fact that it was developed between the roads north of the Finchley Road on the one side and Tottenham Court Road on the other, which drained all the traffic, and which still drain all the traffic out of the unit, meant that it was possible to produce a complete unit facing inwards to the Park, and as such I think it is certainly unique.

In one's youth this period of Regency architecture was very much looked down on as being a temporary form of structure and mass-produced. Really it was the first form of plastic evolution, which rather corresponds with what we are going through now. These buildings were the culmination of the grand manner of the country houses that had been growing up, of the smaller terraces of the Georgian period; it is the unification of those two things which produced the grandiose façades concealing the same form of planning that you get in the Georgian terraces.

My chief plea, therefore, is that the whole of the area should be considered

as a unit. We have lost so many historic buildings in our lifetime that we must think hard before we sacrifice more of them. If a large portion of the Terraces have to be re-built in a very different form, then the architectural conception might well be lost. I do feel that it is worth while concentrating hard on those buildings which need the most done to them, so that with the other ones which do not need so much attention the whole conception can be retained.

*Mr. MacGregor then showed photographs on the epidiascope of most of the terraces concerned.*

THE CHAIRMAN: I should now like to ask a modernist, Mr. Maxwell Fry, what he thinks of the proposals for retention; whether he has any other view, if retention became physically impossible.

MR. MAXWELL FRY, C.B.E., B.A.(ARCH.), F.R.I.B.A.: As to retention, I do not speak with any detailed knowledge of the Terraces, but it must be apparent, I think, even from Sir Thomas's remarks, that the decision to retain the Terraces in principle has yet to be backed by the actual financial and economic facts. It seems at all events doubtful whether the Terraces can be made economically justifiable; if not, who will foot the bill? But the public in general and my brother architects as well approach the whole of the Nash Terrace problem in an aura of sentiment, which clouds the fact that this is also an opportunity to leave our own mark upon our own time. The suggestion is that there are not architects who could do this, and that therefore preservation is the only thing we can possibly do. It is a feeling which besets this age and I think it is understandable. The country is full of the most beautiful things and the best of them we always wish to preserve. But on the other hand there is nothing worse than preserving as a monument something which is in fact a bit of a ragbag.

I would put forward the view (and it seems to me a reasonable one) that with the long life of this great region in the centre of London we should look forward and think of it as one unit, just as Nash did. The whole point of the thing, the beauty of it, is that it was the conception of a single mind, aided by collaborators. With the leases running out and the property in an obvious state of decay it behoves us at this time to think again about the possibility of a new single conception which would be entirely different from the old one. One which might have great powers; which might, as Sir Thomas said, let the rest of London into the Park. The whole of society has changed so much, and the L.C.C. rebuilding elsewhere has shown us something of this change. It seems perfectly possible to make a new work of art, if not through our own architects then through some other foreign architects—through an international competition. But at any rate let us have clear views about it instead of what I greatly fear will happen—that preservation will be pursued and then dropped and we shall get a broken crown instead of this beautiful thing which we can still see.

It is very doubtful whether you can successfully preserve something which depends so much on the society that uses it. If the use really changes much then the fabric begins to show signs of it. I would be the last person to want to

pull the Terraces down while there is a useful life for them, but there must, as an earlier speaker said, be a use for the whole, and I do not at all shudder at the possibility of having to do the whole thing again.

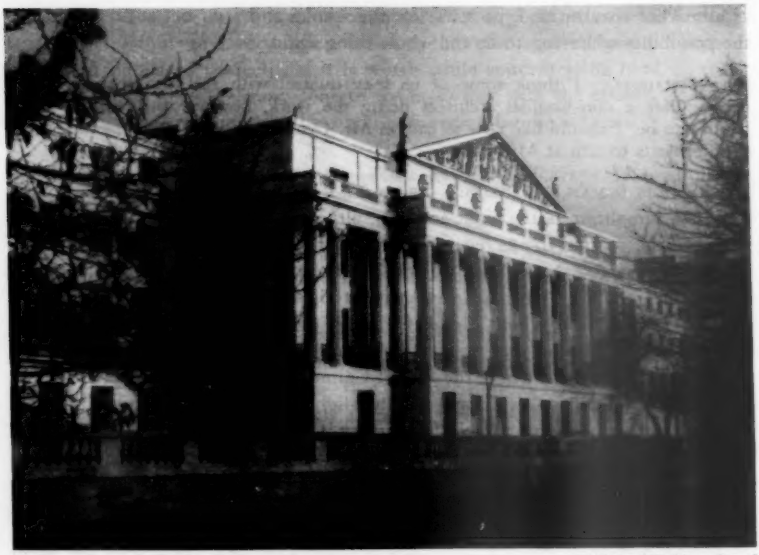
THE CHAIRMAN: I think some of us may quarrel with the idea that we could contemplate a non-English architect doing the work, however brilliant he might happen to be. I should like now to call on Mr. Osman, who may perhaps have some counterblasts to aim at Mr. Fry.

MR. LOUIS OSMAN, B.A.(ARCH.), F.R.I.B.A.: I do not agree with Mr. Maxwell Fry that demolition is the right solution, although I would agree with much of what he said, particularly as regards a single control whatever scheme be adopted. My knowledge of the Regent's Park Terraces is confined in great detail to one Terrace, though I have made extensive studies and inquiries into the structure of the Terraces as a whole. Some five years ago I, with six assistants, made a complete and detailed survey of Cumberland Terrace, and carried knowledge forward from the point where the Gorell Committee had left it in April, 1947.

As a result of this study I have not the slightest hesitation in saying that it is quite possible to preserve the Nash Terraces if the policy of muddle with which the whole thing has been dealt for the past 150 years is abandoned. The buildings started as rather an architectural muddle. Originally it was a money-making idea of the Prince Regent's, and the Terraces were built by various architects and builders in conformity with the general elevation prepared by John Nash, as part of his grandiloquent scheme of town-planning which the Prince described enthusiastically as 'eclipsing Napoleon's Paris'. The finances were quite inadequate to carry out the scheme properly and much had to be abandoned, lessees becoming bankrupt. This explains much of what must now be dealt with. There was then no such building control as now exists to prevent ignorant, shoddy or even dangerous work. The poor and moving sub-soil would to-day demand special precautions in spreading the loads over a sufficient area to reduce pressures to within safe limits. To quote Dr. Oscar Faber: 'The whole construction savours of what would be considered suitable to-day for exhibition buildings.'

But Nash gave his client a wonderful conception and a wonderful hoarding. I should like to read for a moment from John Summerson's *Georgian London* as he sums up the Nash Terraces:

> The Regent's Park terraces are greatly loved to-day—more so than ever they were when they were new, when their shortcomings in detail and finish grated on the susceptibilities of critics bred in an exacting school. The truth is that these buildings, careless and clumsy though they are in many ways, have an extravagant scenic character which, perceived through nostalgic mists of time, makes them irresistible. They are dream palaces, full of grandiose, romantic ideas such as an architect might scribble in a holiday sketch-book. Seen at a distance, framed in green tracery, perhaps in the kind light of late autumn, they suggest architectural glories which make Greenwich tame and Hampton Court provincial. Carved pediments, rich in allegory, top the trees; massive pavilions, standing forward like the *corps de garde* of Baroque chateaux are linked to the main structures by triumphal arches or columnar screens;



[*National Buildings Record*

*Cumberland Terrace (photograph taken in 1954)*

each terrace stretches its length in all the pride of unconfined symmetry. It is magnificent. And behind it all—behind it are rows and rows of identical houses, identical in their narrowness, their thin pretentiousness, their poverty of design. Where the eye apprehends a mansion of great distinction, supported by lesser mansions and service quarters, the mind must interpret it as a block of thin houses, with other blocks of thin houses carrying less ornament or none at all. The sham is flagrant and absurd. The terraces are architectural jokes; and though Nash was serious enough in his intention, the effect is an odd combination of fantasy and bathos which only the retrospect of a century can forgive. . . .

For sheer architectural frolic, the terraces along the east side of the Park are the most striking. Cumberland Terrace (1827) with its seven porticos, its courtyards and arches, is the crowning glory, the back-cloth as it were to Act III, and easily the most breath-taking architectural panorama in London. If it is destroyed it will become a legend and in time to come, architectural connoisseurs will say with awe 'I remember Cumberland Terrace'. With its sketchy detail, its stylistic solecisms and its pretty-pretty sculpture by Bubb, it is a marvellous, adorable extravagance. Chester Terrace (1825) with two gimcrack 'triumphal' arches, superscribed with the name of the terrace, is more moderate in its pretensions. Gloucester Gate (1827) and Cambridge Terrace (1825) are almost conventional by comparison.

Regent's Park is full of amusing and effective detail. Nash's lodges at Hanover and Gloucester Gates and Park Crescent are very neat. The cast-iron railings and street lamps are interesting exploitations of the material. James Morgan's bridge over the canal is a good piece of architectural engineering.

> And there still survive most of the eight villas, including the Holme, built for himself by James Burton and designed by Decimus, and several built by other architects. . . .*

Now when this great scenic panorama had been created, what happened? I do not think that the Commissioners of Crown Lands, as they were then, looked after their buildings very well in the next 120 years. Their main object seems to have been to hand over their responsibility, and individuals acted with little overall control. Before the war I visited a client of mine who lived in Cumberland Terrace and I was ushered into his study, which was framed in Tudor panelling, put up apparently with the permission of the Crown Estate Commissioners. Many of the houses in the Park have had their internal load-bearing partitions removed from the centre. There was no real control so long as the Crown disposed of the properties on advantageous leases. So long as somebody else took over the responsibility, then all was well. The years from 1826 to 1939 were prosperous, but during that time the buildings were allowed to get into a serious state of neglect. Although decorations were carried out, structural repairs were not always done. Additions appeared; additional storeys, and so on. Then came the war, and I do not think there is a single one of the houses which escaped some amount of damage. In 1944 the Government decided that it would allow the Ministries to take over 212, I think it was, of the 374 houses which comprise the Nash Terraces. Almost simultaneously, they decided to set up a Government Commission to decide what should be done—this when they had already prejudiced the issue by letting Ministries begin the process of conversion into offices. When Lord Gorell was appointed Chairman of the Commission on the Regent's Park Terraces he at once wrote to the Government and said how difficult it was for the Commission to report properly when this decision had already been taken; and he pointed out throughout that his recommendation was very much prejudiced by the fact that this decision had been taken. In fact, in the report he wrote:

> My dear Prime Minister,
>
> We have now completed the task you entrusted to us in January, 1946. I enclose herewith our report on the future of the Nash Terraces around Regent's Park. Inquiry has been prolonged and of some complexity but I am happy to be able to say that our report is unanimous. I am, however, sorry to say that we were never free to consider the problem solely on its merits, but have had to make our recommendations conditioned by the decision, taken without our knowledge, before we were appointed, to hand over to the Ministry of Works for conversion into Government offices for an indefinite period no fewer than 212 of the 374 houses on which we had to report. We have done our best within the limitations imposed upon us. . . .

Now the Gorell Report is, as you know, a very full one, based on the best and fullest advice, with evidence taken from a very great number of private individuals and bodies. The late Dr. Oscar Faber was retained to make a close study of the structure, and reported very fully. In fact, Dr. Faber's report has

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been a little misleading to people who probably have not fully understood that, although he reported on all the serious defects in these buildings, he could nevertheless envisage that all these defects could be remedied. The kind of thing that had to be reckoned with was that the buildings were designed firstly as a hoarding, behind which individual developers built structures to suit individual clients who had individual leases. Therefore in many cases there is no clear link between the front façades and what lies behind them; no proper foundations, no damp courses; but this is the case with a very great number of historic buildings and it is perfectly possible to deal with it.

But how did the Ministry of Works, usually so skilled at dealing with historic monuments, set about dealing with this? It is incredible that they dealt with the 212 houses which they had taken over without the advice of any qualified architect. The work was done by the maintenance division of the Ministry of Works without proper architectural advice. The whole thing was done piecemeal; little bits of reconstruction were carried out, without any overall plan. We have been left now with a most muddled mixture of Nash decay and temporary and sometimes frightfully strong repair. They were advised that the measures taken against dry rot would not be likely to be sufficient for more than seven years, the term of the lease which they saw fit to take.

In addition, as one of the major principles upon which any consideration of repair should be carried out, Dr. Oscar Faber had laid down that there should be no point-loading, that there should be no interference with the main balance on the foundations. The Terraces had sunk on to their foundations on a moderately even keel; this had compressed the subsoil, and there would be no undue movement unless foundations were interfered with any more. But despite this, at Cumberland Terrace the Ministry built a reinforced concrete canteen of great weight, with boiler houses with new chimneys, and new concrete foundations, which exerted point loads onto the structure and could not but affect the whole of the stability of that particular Terrace.

That was the situation when the Gorell Report was issued in 1947. The history since then has been of failure to reach any overall decision under competent architectural control as to how to get over the resultant muddle. In my opinion if the Nash Terraces go, it will be due not mainly to Nash or his bad building, but to the muddle-headed and incompetent dealing with the Nash Terraces since he built them.

Now what I mainly fear is that this muddle will continue, and here I clearly agree with Mr. Maxwell Fry. It will be tragic if this great architectural conception is to be destroyed through the dealing with small portions of it unrelated to the whole being allowed to continue. In my opinion, after the most careful and prolonged structural study, it would be perfectly easy even now to preserve the Terraces for a very great number of years. I am not talking about forty or sixty years, which seems to be the Crown Estate Commissioners' Term, and a quite uneconomic one, but for five or six hundred years. But the work ought to be put in the hands of one competent person to co-ordinate all the work of other architects, and who should be given an overall brief to see that the work is done

properly and not in a partial way, doing one bit at one time and another at another.

There would be far more chance of permanent retention if the whole of each of the Terraces were under the control of some responsible body or institution. Such a solution came near to being achieved when, as recommended by the Gorell Committee, the University of London was offered a lease of the whole of Cumberland Terrace for conversion to a University hostel. Unfortunately, little bits were excluded. The old coach houses at the back were apparently very profitably used as garages for taxi men and had to be excluded from the proposed lease. In addition, there were two houses in private occupation. Instead of being able to deal with the site as a whole, these parts had to be excluded. No real attempt was made to give possession of the whole site. Had this been done, and had the Commissioners not insisted on a full repairing lease of a structure they knew to be defective, the whole of Cumberland Terrace could have been converted into a magnificent hostel, which could have ensured its permanent preservation. There would have been no bother with the question of individual lavatories and individual bathrooms; ablution blocks were to be centred in the basement and the façade was not to be altered in any way whatever, but thoroughly, carefully and accurately restored. It is my opinion that it is the insistence by the Commissioners, trying to shift their responsibility on to private and public bodies, by leasing only on full repairing leases, that is at the very basis of the problem of the Nash Terraces. The Commissioners should face up to the fact that they have got a difficult structure, that it is in many ways imperfect, and I think that special financial arrangements should be made to deal with this. I think that then, with the Commissioners paying their proper share, it would not be insuperably difficult to get responsible bodies to pay the necessary balance to convert the Terraces to good modern uses.

It would have been good sense if the Crown Commissioners had offered to pay, say, half the total cost of the University scheme; the University becoming liable only for the other half—say, a quarter of a million each, and thus far more economic than what is now proposed: a capital expenditure by the Crown of over £600,000 on the basis of a sixty-year 'life'. This would have provided 500 student places at very much less than it would cost to build new hostels for such a number. I think that, had that been completed, London would have had something to be very proud of. It would have set a new standard for the conversion of old properties for institutional use.

Now there is Mr. Maxwell Fry's proposed solution—that the whole Terraces are too old and too decayed, and should be swept away, and one architect appointed for an equally comprehensive contemporary scheme. I cannot see so big a decision being made. Imagine its being announced in *The Times* one morning that the whole of the Nash Terraces are to come down, and that just the right architect has been selected to design with the same freedom of action as Nash had! If the Nash Terraces do come down I think a higgledy-piggledy development will follow, but I cannot see any reason why the Nash Terraces in the main cannot be kept permanently. The whole conception should be kept

[*National Buildings Record*

*Cumberland Place (photograph taken in 1958)*

and it is not beyond the powers of architects in England to create, with this great horizontal scheme permanently restored, new, possibly very high, buildings designed in such a way that they will harmonize and contrast with the horizontality of Nash's Regent's Park, which is big enough to take it, making the whole project completely economic.

## DISCUSSION

MR. TERENCE DAVIS: I can only speak as a humble Crown tenant, with a large house in Regent's Park which I converted into five flats, all of which seem satisfactory. They are not perfect by any means, but they are quite good flats. It is a vertical conversion (which is not so satisfactory as a lateral one), but it *can* be done, and on a much bigger scale.

MR. G. VIVIAN DAVIES: I think it would be a tragedy if the Nash Terraces were to go, and I consider that every effort possible should be made to preserve them. Far too many houses of historic and architectural interest are being pulled down, to be replaced in many cases by the most horrible architectural exhibits. I have lived very near the Nash Terraces for the last twenty years (in fact, I am next door to Mr. Maxwell Fry). I have two houses of great historic and architectural merit, and one of them was the residence of Wilkie Collins, the famous Victorian novelist and friend of Charles Dickens. Both houses are absolutely bestrewn with the trade-mark of the Adam brothers; we have Adam ceilings, fireplaces and panelling, and I have restored them as near as I can in the Adam style. They are not provided

with damp courses, but we are not troubled with damp : it has been quite possible to use the basements and to convert them in an intelligent manner. Those houses may be 150 years old, but I think they may last for another 150 years. They have eighteen-inch walls and are cool in the summer and warm in winter. I am astonished to learn that the Ministry of Works should have carried out the repair of the Nash Terraces in such a haphazard manner, because I should have thought the Ministry of Works had plenty of architects.

When I restored these houses, although I am a consulting engineer myself, I called in an architect and saw that the job was done properly. I can see no reason whatever why the Nash Terraces cannot be preserved as the last speaker has indicated.

MR. G. R. M. KNOX: I live in a house in Sussex Place with my family. It is a complete house, and I have various neighbours who occupy between them practically half of Sussex Place; each neighbour consists more or less of one family per house. I often meet people who say, 'I wish I could get a house there for my family', and I feel that we can fill that Terrace easily with one-family residences and preserve it.

BRIGADIER J. L. P. MACNAIR: First of all, may I make a small point about what has been said so far? I understood, when we were talking about these terraces, that we were not only considering the outsides, but also the insides. I feel that there are some features about these houses that we do not really know very much about as 'outsiders'. I have a feeling that the insides of some of these houses are of just as good a quality as the outsides. The only point that has been made about the insides so far is the fact that we have got to face up to the small attics; I personally do not think that that is any problem at all. I have lived in flats and I do not mind a bit living in a flat with a low ceiling. An attic is just as happy a place to live in as a big room downstairs, provided you have a lift in which to get up to it!

There is one part of the Regent's Park area, not strictly in the Terraces, which I think is worth considering, and that is the Park Villages at the top. Here there is an attractive little entourage which could quite easily be extended if we could get some of our best architects to pay some attention to the hinterland behind the Terraces. We are all agreed that we must not pull down half of the Nash Terraces and put something in its place. We have got one horrible example from Victorian days, Cambridge Gate, which is the kind of rebuilding which we want to avoid; if we are to pull anything down, that is the place to start. Another example smacks you in the face every time you go up and down Regent Street, which has been completely ruined in recent years.

Now Mr. Maxwell Fry has suggested that we might pull all the buildings down and give a really good architect of the present day the chance to rebuild the whole on some wonderful new scheme. Surely we want first to think back for the reason why Nash was chosen? His name was not picked out of a hat. People at the time chose Nash because they had seen what he could do elsewhere. If we pulled the Terraces down now what should we do? We should go chasing around to see what modern architects have done—there are any number of areas in London where large-scale planning could have been undertaken, but what we have seen so far is not impressive. We have been putting up buildings which, however brilliant in the utilization of modern materials, have been justly described as modern boot-boxes; rectangular structures without any apparent grace. Could we find some architect who could really produce graceful buildings? I do not say that we could not, but architects have not perhaps been given the opportunity, because they are hamstrung by having to put up a building that should cost a million pounds, for a quarter of a million. That is one of the difficulties at the present. Until we have got somebody who has proved himself able to produce work of the scale and magnificence and beauty and grace of the Nash Terraces it would obviously be highly dangerous to pull them down.

MR. MARTIN BRUNT: I think if Mr. Maxwell Fry were still here he would suggest

that we were all being perhaps slightly emotional. A number of people are in favour of preserving the terraces; I think I agree with them by and large; but we seem to have had few facts. Mr. Davies is a house-owner in the area; if I remember rightly he was sufficiently lucky to get the lease, at a very reasonable figure, of houses well suited to conversion. I wonder if Mr. Osman could give us any actual figures of the cost involved in converting into flats. Would the Terraces, for example, compare with those houses in Richmond, another Crown property, which were converted into flats when they were falling into decay? Whilst I feel very strongly about this question of preservation, I think we need some actual costs before us before going very much further.

THE CHAIRMAN: I rather doubt whether Mr. Osman could give in any public meeting the sort of facts you are asking for, but perhaps he could say something in greater detail?

MR. OSMAN: May I read from *The Future of the Regent's Park Terraces*, the 1957 report of the Crown Estate Commissioners? This can be bought for ninepence. I think the Gorell Report is good value for a shilling and the 1957 one bad value for ninepence, it does not get one anywhere. But it does state that at present prices it is estimated that for every fifty houses converted into flats there would have to be an expenditure of about one million pounds—does that answer your question?

The point which I tried to make earlier is that it is not just this question of the capital cost of conversion which is important, but the question of responsibility for the inherent defects of these buildings, and which like any disease can be held in check but cannot be entirely eradicated. Once the policy that people should be asked to shoulder an unknown responsibility, which is really the Crown Commissioners', were to be abandoned, and the whole facts honestly and openly faced, then much of the difficulty, both of permanent preservation and of economics, would be solved.

## CONCLUSION

THE CHAIRMAN: It is unanimously felt, I think, that all the work around Regent's Park is conceived on a scale which is not repeated anywhere else in London, and in few other great cities of the world. As far as England is concerned, possibly Bath and Cheltenham are its only rivals, and certainly their scale does not compare with that of the Nash work in the Regent's Park Terraces. So that we have a heritage here of quite exceptional merit, quite exceptional grandeur, quite exceptional extent as a unified development. We could not lightly destroy the Nash Terraces.

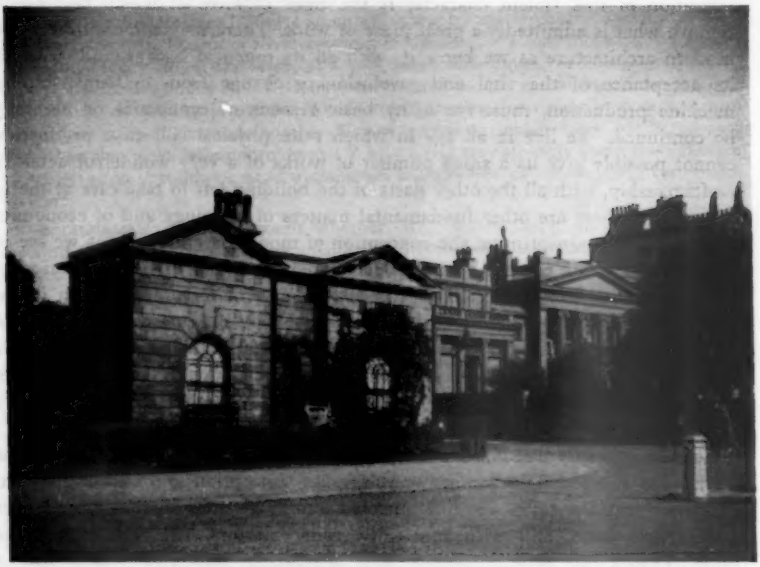
If I may jump at once to the other end of the scale—if it were ever to come about that the buildings themselves were physically incapable of further life or that they required so much mending that they were inefficient units, there would arise the question of general circumstances which must apply at a moment when any responsible body of people decide that the time has come to remove so important an architectural heritage. Reference has been made this afternoon to examples of modern architecture which to many people are anathema, monstrosities rather than great works of art. Conversely we have a younger generation, growing up in an iconoclastic age, which feels that what was done in a former age, because it had so many bad results socially, was equally bad from every other point of view, and that therefore change at any price is desirable, whatever it means in the way of destruction.

It must be a matter for serious thought whether a period of architectural

transition of this violent character is the right moment at which one would remove what is admittedly a great piece of work. There may come a time when modern architecture as we know it, with all its practical background, with all its acceptance of the vital and revolutionary change from craftsmanship to machine production, must for many basic reasons of economics or necessity be continued. We live in an age in which pure physical collective production cannot possibly give us a small number of works of a very wonderful detail in craftsmanship, with all the other parts of the building left to take care of themselves. And there are other fundamental matters of sociology and of economics which are the mainspring of the conception of modern architecture as we see it. Nevertheless at its present stage of development it is new, it is in a period of transition. There is no period in the history of architecture in which it has settled down to a high standard of production in an extremely short time and then shown no further development. There are examples of buildings that have sprung into existence from a very sketchy background, such as the great mosques of Constantinople, but as a whole architecture is a progressive art and to remove a great monument at the time of transition is a doubtful policy.

Equally it is true that Nash was chosen because he had already produced fine works. He succeeded in producing this great conception and carrying it out, and the circumstances of the time enabled him to go on with that project over a series of years, still with much the same masters, still with much the same outlook on artistic design, still producing buildings which had a contemporary value. The second great feature of the towns in which we ourselves live is that we are moving in an unknown direction almost year by year and the type of house in which we want to live, the surroundings in which we have to exist, are conditioned by the availability or otherwise of money, of domestic help, of capital investment, and of all sorts of things which impinge on architecture to an amazing extent. Therefore I think that for many reasons it would be bad at this particular moment in time to attempt to sweep away something which is unquestionably fine.

We have in the Nash Terraces themselves the antithesis of some of the things at which the modern architect aims. We have to keep them in fine condition. There is a very high maintenance cost. Plastered stuccoed buildings look magnificent when the paint is new, but they look deplorable when the paint is shabby and ill-conditioned. They are subject to really serious decay if they are neglected over a number of years. In many cases they have roofs with poor timbers, and you can only replace them by taking off the whole roof and re-roofing. So essentially they are alien to the principles of modern building, but whether a modern building will stand up on its own principles is not yet clear. We also face a future which is by no means stable, and the tendency is to advocate buildings to last for a limited period only. The background of thought to-day is on the whole against building for an unlimited term of life. We have seen such revolutions of construction, such revolutions in methods of living, such a revolution in education, so vast a change in a very few years, that we hesitate to think that what we are building to-day should be put up in such a way



[*National Buildings Record*

*Gloucester Gate* (*photograph taken in 1933*)

that it will last for one hundred or two hundred years. Therefore again we doubt whether this is the moment—though there may well come a moment—at which to destroy a unified work of this importance.

We therefore probably agree with those who say that the façades of the terraces should remain. How should they be retained? There is a very strong argument against replacing small portions. We are bound to hesitate when we come to a piece of work such as the Victorian building at the end of the eastern side of the Park. We are doubtful whether a small building standing by itself like Someries House, which bears no real connection with the rest of the Terraces, should not be swept away if there are good reasons for doing so. I think we must deplore the half-hearted attempt of the Ministry of Works during the period of the war to repair its own houses in a wholesale fashion. Yet I also think we must remember that the Ministry was given this office accommodation at a time when accommodation was unobtainable and conditions did not justify building. Here was a large unoccupied number of square feet which Ministries could take over and use. The interiors vary enormously in the Terraces. In some houses there are beautiful interiors. In many of the buildings on the south-western side, occupied by the Ministry of Works, with holes pierced through the party walls, there is nothing of which I could regret the passing, so far as the interiors are concerned.

We have, of course, to cope with the inherent difficulties in dealing with

buildings of this kind: for example, the fairly widespread lack of foundations; the absence of damp courses, party walls in many cases riddled with flues. All of us who have had to deal with houses such as those in Eaton Square know that there are quite serious constructional troubles. It may be that some owners escape damp in the basements, it may be that others can do nothing which will keep it under control and have to abandon their use. So one cannot minimize the problem, and you get to the point Mr. Osman raised, as to who is to bear the financial responsibility. If the Crown has decided that it must retain the Terraces because that is what public opinion demands, then the Crown may well have to bear some portion of the maintenance risk even if it does not bear the maintenance cost. In other words, in granting leases there must be a limit of risk, a point at which, if the new lessee faces physical collapse or some calamity of a major kind, he should no longer be responsible. We know that the measure of that risk varies enormously with old buildings. When you have an unbalanced risk it may well be proper to expect the advisers of the Government, the Ministry of Works or the Crown Estate, to carry some measure of that risk.

Then there is the question of whether you should develop horizontally or vertically. On the whole, I think it would be true to say that the best chance of new life for the Terraces would probably be to reconstitute and repair them in substantial blocks under unified control—if, that is, you were able to pass the whole of Cumberland or Chester Terrace or one of the other Terraces, York Terrace, for example, into the hands of a substantial, responsible body which would be known to have substantial resources behind it, and which would have some overriding interest other than just financing property. The passing on of this responsibility in large sections is probably better than passing it on in small sections. There are other advantages of this policy. You can repair party walls under common ownership, you can let your new foundation extend beyond ordinary property boundaries, you can use drainage in a substantial way in renewing it not merely in small sections.

Horizontal conversion is one of the other possibilities. That again is partly a matter of deciding whether the detailed construction permits of horizontal connection. Some of the party walls are not too thick. They are perfectly adequate for their purpose as long as they remain unpierced (as they were intended to be) but if you cut substantial holes in them and throw point loads on other parts of the structure, subjecting the foundations to unequal loading, then what is perfectly adequate in its original distributed loads may be quite inadequate when you come to rearrange the distribution. I think also that some of the other things which necessarily must be brought into a modern building—a greater amount of piercing of floors and walls, of pipes, a greater installation of plumbing of various kinds, introduction of heating schemes, construction of boiler houses—all of these things must of necessity cut into a structure which, like many buildings, is perfectly sound as long as you leave it alone. So those are matters in one sense of economics, as to whether the new use will stand the capital cost which must be sunk when it is combined with the ground rent which the Ministry or the Crown Estate will presumably ask for the new building.

There is still another thing which could be done. When Nash designed these buildings they were rather in the nature of a façade behind which were placed structures not necessarily wholly related to the façade. Therefore what we are most concerned to see is that the skyline is maintained, that the Terraces are left in their present horizontal level, that the balustrades, the balconies, and all the other architectural details which go to furnish them and make for their variety, are left as they are to-day. It may well be that this is one of the few cases where it is a proper thing to put a different sort of building behind the façade, and lace the facade back into it. This is by no means an impossible piece of construction, if proper use is made of steel and concrete and the external appearance is left undisturbed.

Therefore there are two, three or more ways in which the buildings can be given a lease of life. But that they must be put into responsible hands is beyond question; that they need a really practical approach on the part of the Crown Estate Office, the Ministry, the London County Council and the people who control buildings, there is no doubt.

If one thing more than another has been brought oue by this meeting to-day, it is the widespread feeling among all kinds of people that the Nash Terraces, in spite of all their faults of detail, must be preserved, and that the general appearance of the Park should remain what it is to-day for a further period.

*A vote of thanks to the principal speakers was carried with acclamation and, another having been accorded to the Chairman, the meeting then ended.*

## APPENDIX

*We have received the following communication from* MR. LESLIE LEWORTHY, *who was present at the Symposium on 4th March, but was prevented by a throat infection from making any verbal contribution to the discussion:*

I wonder if I might be allowed to comment on one or two aspects of last Thursday's meeting.

The third speaker, Mr. Louis Osman, opened his remarks in a negative way by saying that he had only been concerned with one section of the buildings and did not really know much of the rest of the park; but subsequently went on to make a general charge that the standard of maintenance during the Ministry of Works stewardship since 1946 had accelerated dilapidations and that in any case the 1946 conversions had not been carried out by qualified architects.

I can write with some authority because, although I attended the meeting as a Fellow and not in an official capacity, I am a District Engineer in the Eng. (Mtce.) Division of the Ministry of Works organization and for the last nine years have been responsible, among other things, for the maintenance of the engineering services in the buildings occupied by Government departments on the Regent's Park perimeter.

Whatever is said about the present condition of the Nash Terraces one must take into consideration one factor that I do not recall being mentioned by any speaker, namely the effect of war damage. The area was well and truly peppered with bombs, and whilst there were few direct hits, there were many near misses. The new Planetarium at the corner of Allsop Place and immediately behind the junction of Cornwall and York Terraces, is built on the site of one. The bottom of Regent's Park lake contains

a number of bomb craters, and a walk round the Outer Circle will disclose many other wartime scars, and the region of Cumberland Terrace is no exception.

The point is that the earth tremors from all of these incidents had a far more devastating effect on the adjacent buildings than any slight variations of point load consequent on 'cut throughs' or other minor adaptations carried out during the period of conversion.

Until recently the future of the buildings has always been in doubt and, having full knowledge of this, our task has been to maintain, not to restore, and no more has been done than was absolutely necessary. At one point in the introduction an internal temperature of 70°F. was mentioned. In general, it is quite impossible for the L.P.H.W. heating installations to provide this as their maximum design capacity has been for an internal temperature of 65°F. with an external temperature of 30°F., and operating instructions provide for reductions in flow temperatures to correspond with increases in external ambient conditions.

Mention was made of the ravages of dry rot. My colleagues on the building side will tell you that many thousands of pounds have been spent in eradicating and keeping this growth at bay, and further, that other large sums have been spent in painting and redecorating.

In general, therefore, it can be said that some 200 of the Nash Terrace houses are none the worse for their Civil Service occupation. On the contrary, they are in a very much better state than they would have been had they been left empty and, in many cases, with only temporary war damage repairs.

On the qualifications of the staff concerned, I need only refer Mr. Osman to the British Imperial Calendar and Civil Service List for 1946 and the following years. He will find there ample support for the comment, made in the discussion, that the Ministry 'has plenty of architects'.

*Mr. Louis Osman writes:*

As will be seen from the printed report in the *Journal*, I did not say that I 'had only been concerned with one section of the buildings and did not really know much of the rest of the park'. In fact, I have a very detailed and very depressing knowledge of what happened in the rest of the 212 houses upon the Ministry of Works taking over. I fully understand the magnitude and complexity of the problems they had to face. I also have no doubts as to the individual competence and devotion to duty of the many persons who carried out details of the work. My point was that it is tragic that these efforts were not part of a properly co-ordinated scheme under a properly qualified architect.

I am afraid that Mr. Leworthy does not see the whole picture, so poignantly summed up on page 59 of the Gorell Report:

'It is thus of the first importance to observe that the steps taken by the Ministry of Works . . . while very likely quite adequate for their expected tenure . . . are dangerously inadequate. . . . We are, in fact, confronted with the paradox that, though the taking over of these houses by the Ministry of Works and the consequent reconditioning for use as government offices in the immediate future has had the effect of checking the very recent and extensive deterioration and so of prolonging, on a short-term basis, the life of these houses, it has, at the same time, prevented the eradication of the main causes of such deterioration and so has immensely increased the task of their more permanent preservation.'

[*The latest statement by the Crown Estate Commissioners on* The Future of the Regent's Park Terraces, *published after this meeting took place, is noticed on p.* 442 *below.*]

# SOME ACHIEVEMENTS OF THE INTERNATIONAL GEOPHYSICAL YEAR

*A paper by*

*D. C. MARTIN, B.Sc., Ph.D., F.R.I.C., F.R.S.E., Assistant Secretary, the Royal Society, read to the Society on Wednesday, 11th March, 1959, with the Right Honble. Lord Nathan, T.D., F.S.A., J.P., D.L., President, the Royal Geographical Society and a Member of Council of the Royal Society of Arts, in the Chair*

THE CHAIRMAN: I am very glad to see so large and so distinguished an audience for to-day's lecture. I am here in a dual capacity: primarily, perhaps, as a Member of the Council of the Royal Society of Arts and thus as host to those present to-day, but also as President of the Royal Geographical Society (one of whose Vice-Presidents, Sir Miles Clifford, I am glad to see here). In that capacity it fell to me a few weeks ago to open, at the House of the Royal Geographical Society, the U.N.E.S.C.O. Exhibition about the International Geophysical Year.

I am much too old a hand to attempt to address you upon a subject on which many of you are experts. I am also much too old a hand, from a long and wide experience of chairmen, to try and introduce the subject to you by editing it in advance for the lecturer. Dr. Martin has had a long association with the Royal Society of Arts. He had not long come down from the University of Edinburgh when he was appointed Assistant Secretary to this Society. He took up his duties here on the very day on which war began in 1939. He was not, however, long with us; towards the end of that year, 1939, he was seconded to the Government for duties elsewhere. He never came back as an officer of the Society, but when the war was over and he returned to civilian, peacetime life, he joined it as a Fellow and he is now a Life Fellow. So to-day, in calling upon Dr. Martin to address you, I do so with all the more pleasure because he is a past official, and a present Fellow, of the Royal Society of Arts.

*The following paper, which was illustrated with lantern slides, was then read.*

## THE PAPER

I feel greatly honoured to be invited to present this paper about the International Geophysical Year to the Royal Society of Arts, whose Royal President has shown such great and active interest in the subject. To those of us concerned with the British contribution his interest has been a stimulus and a great and continuing encouragement. Many of you will recall the memorable television programme entitled 'The Restless Sphere', in which H.R.H. the Prince Philip introduced the International Geophysical Year to viewers on 30th June, 1957, that is, a few hours before it began.

As we live our day-to-day existence and see it from the limited viewpoint

of our immediate environment, we take many things as quite certain and finally determined. Man more or less adjusts or is adjusted to his immediate environment. He can provide himself with local heat, clothing and buildings for his protection. He has learned to provide local power sources from natural fuels and controlling water movement. But if we inquire a little into the cosmic environment of his planet earth and the forces which act on it, we find many unanswered questions. Earth is a member of a family of planets. It spins on an axis and moves around the sun, the centre of the solar system. Any major change in the sun would wipe out the human race, as earth stands in a critical relationship with this central source of life-giving power. Life on the earth's surface is protected by its atmosphere, again dependent on the sun. This atmosphere protects us from the dangers of outer space, for example, cosmic rays and meteors, and it provides us with the air we breathe. It is important in the budget of the heat and water relationships on the earth's surface. Another element in this budget consists of the oceans which cover two-thirds of the surface. And what of the solid earth itself? If we were to take an apple and cut it through, the earth's crust and its atmosphere would be represented by the skin of the apple. As yet we have not penetrated underneath the crust and we can only deduce what goes on there from indirect experiment. We really know so very little about the physical forces and processes which determine the conditions in which we exist. We have detected and measured the earth's magnetic field, we know that there are sunspots and we have detected the cosmic radiation reaching the surface of the earth, but we do not yet fully know why such phenomena occur. We can make a reasonable attempt to forecast to-morrow's weather, but next week's or next month's or next year's still baffles us, because we don't know enough of the weather-forming processes. To try to find some of the answers to these questions is the reason for the International Geophysical Year, or the I.G.Y. as I shall call it for short.

## THE ORGANIZATION OF THE I.G.Y.

Planning the I.G.Y. called for a large effort over many years. It was done by the International Council of Scientific Unions, which appointed a special international committee of experts for the purpose. The committee, with the aid of national scientific organizations of which the Royal Society was one, proposed the programme and named the period, 1st July, 1957, to 30th December, 1958, when the sunspot maximum was expected. Standardized procedures and timetables were circulated beforehand. Full details of all these plans and the list of participating stations will be recorded in the *Annals of the International Geophysical Year*, which is a journal specially created to serve the I.G.Y. organization. An estimate of the total number of stations would be in the region of, say, 4,000, with several thousands more with volunteer observers. It is estimated that about 30,000 scientists, engineers and technicians took part and, taking into account all the support services, for example, in transporting personnel to Antarctica and elsewhere, one rough estimate made by our U.S.A. colleagues of the total cost is £500 million.

To have been a participant in the planning phase has been a stimulating experience. We have seen a simple concept, mooted in a private home in 1950, catch the imagination first of a few interested scientists, then the emergence of enthusiastic support of national scientific institutions which have successfully persuaded Governments to provide the financial resources required to execute their plans. Then came the realization of the plan in the form of the greatest co-operative scientific enterprise in history, providing an encouraging example of many nations working together with a common aim. Some of us regard this as one of the greatest achievements of the I.G.Y., and as we shall see later it holds promise for further endeavours which could be of considerable importance in world affairs. For example, here is a quotation from a national newspaper:

> The past eighteen months of the I.G.Y. have completely affirmed the enormous efficacy of the ideas going into its organization and have completely justified the not inconsiderable outlay of material resources and human effort put into it. One can confirm this boldly even now regardless of the fact that the assimilation of the scientific data received has only just begun. . . . In the future [our] scientists will do everything in their power for the further widening and deepening of international collaboration. We hope that our colleagues abroad will share these aspirations and on their side will help in the continuation and strengthening of the international scientific collaboration so well carried out. The I.G.Y. has brilliantly demonstrated all the scientific advantages of similar mutual creative efforts by scientists of all countries.

That was from a translation of an article in *Pravda* (29th December, 1958, No. 363) and was written by a Soviet scientist (V. Beloussov).

As our Soviet colleague mentions, the assimilation of the observational data has just begun. The plan for this was made some time ago. It was agreed that data resulting from the I.G.Y. studies would be deposited in three World Data Centres: one in the U.S.A., one in the U.S.S.R., and a third dispersed between a number of scientific institutions at other localities, many of them in Western Europe, as follows:

WORLD DATA CENTRES

| *Centre A, U.S.A.* | *Centre B, U.S.S.R.* | *Centre C* |
|---|---|---|
| With 11 sub-centres at different institutions (all subjects) | 3 sub-centres in Moscow, 1 in the Crimea (all subjects) | Meteorology (Switzerland)<br>Geomagnetism (Denmark, Japan)<br>Aurora (United Kingdom, Sweden)<br>Airglow (France, Japan)<br>Ionosphere (United Kingdom, Japan)<br>Solar Activity (Switzerland, Italy, France, Germany, Australia)<br>Cosmic Rays (Sweden, Japan)<br>Glaciology (United Kingdom)<br>Rockets and Satellites (United Kingdom)<br>Seismology (France)<br>Gravity (Belgium)<br>Nuclear Radiation (Sweden, Japan) |

Those in this country are located as follows: The auroral Centre is in the Balfour Stewart Auroral Laboratory, Department of Natural Philosophy, University of Edinburgh, the ionospheric and rockets and satellites Centres

are at the D.S.I.R. Radio Research Station at Slough, and the glaciological Centre is in the care of the British Glaciological Society and is housed at the Scott Polar Research Institute of the University of Cambridge. One of each of the three World Data Centres A, B and C will receive original copies of I.G.Y. data from countries that elect to use that particular centre as the archive for their data. Each Centre will then supply copies to each of the other two. By international agreement any scientist may request and be supplied, at the cost of reproduction, with copies of data he requires. I am pleased to be able to report that the record of interchange is already impressive, and it is clear that the wholehearted co-operation which characterized the observational programme is being maintained: for instance, World Data Centre A reports that up to the end of 1958 in the cosmic ray programme data had been received from 70 out of 111 stations representing 21 of the 30 nations participating, and in geomagnetism from 115 out of 262 stations representing 30 of the 49 nations participating. Reports from Antarctica are not included, as expeditions would not have returned with their data.

Some idea of the magnitude of the data-collecting operation may be obtained if we consider the meteorological programme. This is being organized by the World Meteorological Organization (W.M.O.) in Geneva. The way in which the data is being reported was prescribed beforehand in a series of standard forms. These are being returned to the World Data Centre at the rate of 7,000 per week and there they are being reproduced on to microcards, each containing from 40 to 96 forms. It will require 18,500 such microcards to report all the I.G.Y. meteorological data. I calculate that the cards for surface synoptic observations only would probably number 2,890. Each card contains 80 forms, each with 120 observations for each five day period of the I.G.Y. There are about 2,100 stations, so that in all there will be recorded nearly 28 million observations. If it is assumed that each of the 18,500 cards contains the same amount of data, the W.M.O. will have 178 million observations in its collection. This assumption is on the high side, but the magnitude is clearly very great. The meteorological data may well contribute about half of the total I.G.Y. observational data in quantity. I give this example to underline the fact that so much of the I.G.Y. is of a synoptic character and that we cannot expect results for some years to come. Even with the aid of computers the reduction of the data, its study to discern patterns and trends, calls for an enormous effort yet to come. For the first time it will be possible to compile daily weather maps of the entire globe, but these will become available only in a year or two from now. The I.C.S.U. has set up appropriate machinery to encourage the reduction of the data, their publication in reduced form in the *Annals*, and their discussion over the next few years, principally through the international scientific unions. In due time the fruits of this great harvest of information will ripen in the form of well-considered papers in the established scientific journals throughout the world. These will all be carefully recorded in a bibliography of papers on I.G.Y. studies, which can only be completed at a relatively distant date, but preliminary provisional issues have already appeared.

SOME I.G.Y. SCIENTIFIC ACHIEVEMENTS

In the compass of this paper, as you will appreciate, it is not possible to give anything other than a few examples of some of the more obvious events of the I.G.Y., a few gleams, as it were, of the gold yet to be mined. The synoptic work not only in meteorology but in geomagnetism, aurora, ionospheric studies, the mapping of the incidence of cosmic rays on the earth, glaciology, seismology, and gravity, will all need further study to reveal the full implication of this large concerted observational programme. I propose therefore to mention only a few items and will take examples from the programme illustrative of the sun, the earth's surface, the oceans, and the earth's atmosphere.

(a) *The Solar Patrol*

As the sun is the mainspring of all I.G.Y. studies, I shall begin with the solar patrol.

Whilst the scientific planners selected a period of sunspot maximum for the I.G.Y. they could not have foreseen that they had chosen the period of greatest sunspot activity since records began to be kept in 1778. The all-time record was about mid-way in the I.G.Y. period. Outbursts of energy on the sun called solar flares are associated with sunspots, and as these flares are the principal influence on solar terrestrial relationships, let us examine them in closer detail. They emit radiation of two main types—waves and particles. Some of the waves come to us as visible light. Some have wavelengths which are shorter; these are the ultra-violet and X-rays. Some are longer in wavelength and these are the radio waves. All these waves come at the same speed of 186,000 miles per second and travel the 92 million odd miles between the sun and the earth's surface in 8·3 minutes. Earth-bound observers can receive the light on optical instruments, one of the principal of these being the spectrohelioscope. Fifty stations throughout the world have been making observations at set times in hydrogen light. About half have been making them visually and the other half with automatic heliographs which photograph the sun's disk through Lyot-type filters at about one-minute intervals. One of these Lyot H $\alpha$ heliographs of advanced design was established at the initiative of the British I.G.Y. Committee in the Royal Observatory at the Cape of Good Hope early in 1958. It recorded over 694 flares in its first nine and a half months of operation up to the end of the I.G.Y., and completed an automatic 7-hour watch on the sun every clear day. Taking together all the spectrohelioscope observations, the coverage of the sun's activity has been nearly 90 per cent of the possible hours, and with these and other types of solar observation we have compiled the most detailed record of the sun ever achieved.

The shorter waves, the ultra violet and X-rays, have a marked impact on the ionosphere, the mirror in the sky, consisting of electrified layers which reflect radio waves sent out from earth surface transmitters and which make long-distance radio communication possible. When these short waves disturb the ionosphere, we have a radio fade-out and so we can detect the disturbances on our radio receivers and accurately record them.

The longer radio waves coming directly from the sun can be recorded by the

radio telescopes, and among stations which have been 'listening' to the sun are radio telescopes at Jodrell Bank and Cambridge University.

The *particles* travel much more slowly—on an average at about 1,000 miles a second—and they follow on the *waves* some twenty-four to thirty-six hours after the wave effect has been noticed. These are all charged particles. One group, mainly positively charged, are cosmic rays, and their incidence has been measured by monitors on the earth's surface at over 100 stations. The other group consists of ions and electrons, and the impact of these charged particles on the earth's outer atmosphere has the most dramatic of all the influences of a solar flare. They cause magnetic storms which have been known to disrupt line transmission of electricity in some northern cities. They are known to be closely associated with the appearance of the aurora, known in this hemisphere as the Northern Lights. They also cause ionospheric storms with consequent severe disturbance of radio reception.

The I.G.Y. scientist seeking a better understanding of these influences of the sun has therefore been keeping a careful record of magnetic storms at over 250 magnetic observatories. The appearance of the aurora has been carefully recorded by a greater corps of observers, many of them volunteers, than ever before. Men on ships and aircraft have assisted in recording their visual observations of the detailed changes in form and movement of aurora. Automatic cameras photographing the whole sky have been operated in the higher latitudes at night-time. In day-time, radio echo methods have been used to record the aurora. The ionospheric physicists at more than 250 stations have obtained vast records of the sun's influence on the ionosphere.

The I.G.Y. had the best possible start, for on the first day, 1st July, 1957, there was a great solar flare, which gave rise to all these phenomena caused by solar wave and particle radiation, and especially to an extraordinarily fine auroral display. Activity remained high for the opening five months. During the I.G.Y. as a whole there were twenty-one occasions when a Special World Interval was declared, thus enabling I.G.Y. scientists everywhere to intensify their measurements during these periods when these atmospheric disturbances followed the outbursts of major solar flares.

During these periods rockets were flown to high altitudes to make direct measurements of the radiation, and experiments by U.S.A. scientists have shown the existence of a powerful flare of solar X-rays in the wave band 1 to 8A°, and that this is very probably the cause of the short-wave radio fade-outs. A fine opportunity to examine the sun's short-wave radiation presented itself when there was an eclipse of the sun on 12th October, 1958. From a point in the zone of totality, the Danger Islands in the Pacific Ocean, five rockets were launched by U.S. scientists with instruments to measure the ultra-violet radiation and the X-radiation. Four rockets, reaching to 140–150 miles, sent back radio messages, which when interpreted showed that the ultra-violet radiation diminished as the surface of the sun was obscured by the moon, but that the intensity of X-rays remained the same. This was considered to be the first conclusive proof that the source of the X rays is the sun's outer atmosphere,

or corona, which remained as a halo during the eclipse, and that the ultra-violet radiation comes from the solar disc or chromosphere. The ionospheric soundings confirmed the continued existence of a reflecting layer.

There have also been great advances in the U.S.A. and the U.S.S.R. in the detailed studies of magnetic fields in active solar regions, and it appears that in a flare there is a sudden conversion of magnetic energy into wave and particle radiation.

The record of all this solar observation will constitute one of the most important of the volumes of the *Annals* in which, it is proposed, there will be two maps, each printed in colour, for each of the days of the I.G.Y. As a supplement to this, and only for general reference, there will be a *Calendar Record* which will be a concise summary day by day of the principal solar, geomagnetic, ionospheric, cosmic ray, and other events during the I.G.Y.

(b) *Antarctica*

As an example of studies related to the earth's surface, I should like to tell you about the I.G.Y. programme on the seventh continent, Antarctica. It may be asked, why choose the coldest place on earth for such studies? There are two very good reasons. First, the I.G.Y. study is world-wide, and without information from this great land mass the collection of observations would be seriously incomplete. Secondly, both polar regions are highly important because, as the earth is a great magnet, those charged particles from the sun which I have been describing are drawn towards the earth's magnetic poles and the phenomena they give rise to, the aurora, the magnetic storms and so on, are more pronounced there than anywhere else on earth. Before the I.G.Y. we knew practically nothing about Antarctica. There had been individual journeys of exploration, many of them of an epic character. One only needs to mention the names of Amundsen, Scott, Shackleton, Mawson, and Byrd to recall the great deeds of the past. But these small parties could only investigate a minute part of this uninhabited continent, which is as large as the U.S.A. and Europe taken together.

Because of its importance in geophysics it was proposed that as many nations as possible should send expeditions to the Antarctic mainland, and sites were suggested to achieve a ring of stations round the South Pole. Before the I.G.Y. only Australia at Mawson had a permanent base on the Antarctic mainland, whilst Great Britain, Argentina and Chile had a number of bases on the Antarctic peninsula which we call Grahamland. In addition, there were bases on some of the neighbouring islands. This lack of bases contrasts markedly with the many permanent stations in the north polar regions—where incidentally there are also a few stations whose scientists live and work on stations on ice floes which drift about in the ice-covered waters surrounding the North Pole. One of the Antarctic sites selected as being particularly desirable was in Vahsel Bay at the head of the Weddell Sea, and although this had a bad reputation for navigation because of the danger of heavy pack ice, the Royal Society, after consulting many authorities, decided in August, 1955, to make the attempt to set up an Antarctic I.G.Y. base there. We received ready and expert assistance from the Governor

of the Falkland Islands and his colleagues of the Falkland Islands Dependencies Survey. Apart from an initial setback, when the ship chartered for the voyage, the M.V. *Jopeter*, was crushed in the ice off Greenland in mid-September, 1955, and another ship had to be chartered, good fortune was on our side. The Royal Navy agreed to the secondment of Surgeon Lieutenant-Commander David Dalgliesh, a doctor who already had Antarctic experience, to be the leader of the small advance party, which also included three scientists led by Major G. E. Watson, R.E.M.E. (seconded from the Ministry of Supply). The expedition leader's orders stated that the base should be established south of 75° South latitude, since on the information then available this would be a very appropriate spot from which to observe geophysical phenomena. There is not time to-day to give a detailed account of the splendid achievement of the advance party. Commander Dalgliesh and his nine men selected a site for the base at 75° 31′S. 26° 36′W. early in January, 1956. By mid April they erected a huge base hut 130 feet long and 30 feet wide, living meanwhile in tents. During the year a limited but valuable programme of scientific work was carried out in auroral studies, meteorological observations and ionospheric studies. In the autumn of 1955, Dr. (now Sir Vivian) Fuchs was preparing to set up his advance base for the Commonwealth Trans-Antarctic Expedition also at Vahsel Bay and, some weeks after Dalgliesh had selected his site for the I.G.Y. base, Fuchs established his advance party at Shackleton base in latitude 77° 57′S. and longitude 37° 16′W. Later in 1956 the Royal Society's suggestion that the name Halley Bay be given to the I.G.Y. base and the bay at which the party and its stores were landed was adopted. This was done to commemorate the tercentenary of the birth of Edmond Halley, a pioneer geophysicist and sometime Secretary of the Royal Society, whose lineal successor in the office of Assistant Secretary of the Society I am privileged to be.

Following the honour of a visit by H.M. the Queen on the occasion of their departure, the main parties of both the Royal Society's I.G.Y. Antarctic Expedition and the Commonwealth Trans-Antarctic Expedition left London in the *Magga Dan* on 14th November, 1956. M.V. *Tottan* went along, too, to carry supplementary stores for our 20-man expedition. Both ships had successful voyages. M.V. *Tottan* was shared by the Society and the Norwegian Polar Institute in the 1957 relief voyage, and she again successfully completed her mission to Norway Base and Halley Bay. Colonel Robin Smart, R.A.M.C., was leader of the main I.G.Y. party for its first year, and Mr. J. MacDowall (leader of the meteorological and geomagnetic group in 1957) assumed the leadership in 1958. Because M.V. *Tottan* and her captain had been so outstandingly successful in the voyages to Halley Bay she was again chartered for the voyage in 1958, when the I.G.Y. party was brought out after having done remarkably fine work of which we are all very proud. *Tottan*, after being ice-bound for about a week, reached Cape Town on the homeward journey on 6th February, and our Antarctic colleagues arrived home a few days ago, bringing with them a great harvest of new scientific information which will be carefully studied.

The programme comprised almost all the subject divisions of the I.G.Y. Meteorological observations were made both at the surface and by upper-air balloons carrying radio sondes launched twice a day. These provided temperature, pressure and humidity measurements, and the windfinding radar equipment was used to track the sonde balloons to great heights in all weathers. The measurements made on the ozone layer in the atmopshere included readings made by the Dobson spectrophotometer since 1956, and during 1958 use has been made of a new equipment devised by Dr. A. W. Brewer of the University of Oxford for making direct measurement of the vertical distribution of ozone. This uses an electrolytic absorption method of measuring ozone, and the apparatus which carries out the measurement is flown in a Dewar vessel attached to the balloon-carried radio sonde. These ozone measurements are proving of great interest.

The observation of aurora has also been part of the programme. This has been done visually, by automatic camera and by using radio echoes. We cannot yet present a complete picture for the I.G.Y. period, but results in 1956 and 1957 have been very successful. The automatic camera takes a succession of exposures, of about 15 seconds in duration, of the whole of the sky as reflected in a spherical mirror, and during an auroral display the whole history of its development can be traced. A rotating aerial is used in making the records of radio echoes from aurora, and this can be used during daylight when the auroral light cannot be observed. A similar apparatus is used at Jodrell Bank, and a comparison has shown that it is reasonable, for the first time, to conclude that the great aurora of the northern hemisphere are accompanied simultaneously by a greatly enhanced activity of the southern aurora.

Geomagnetic records have been made daily since the spring of 1957, and a small team of radio scientists has also been making daily records of the behaviour of the ionosphere by reflecting radio waves vertically from it, measuring its absorption and its drift, and by receiving through it radio waves emitted by the radio star Centaurus. Radio echoes from meteors have been recorded and a table of hourly rates compiled. Earthquake shocks have been recorded on a seismograph and glaciological measurements have been made to measure the accumulation and ablation during the period, and, by digging a pit, the rate of accumulation in years prior to the I.G.Y. has been measured: this provides a clue to the weather which prevailed in these former times.

I have given this brief outline of the scientific activities of one I.G.Y. station because they are typical. Similar measurements and others have been done at the other I.G.Y. stations. Twelve nations, the Argentine, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, the Union of South Africa, the U.S.S.R., the U.S.A. and this country have set up or maintained some 57 stations in the Antarctic or sub-Antarctic region. Over 40 of these stations are on the mainland or on the Antarctic Peninsula, and expeditions from these stations are now returning with their data. In addition, we have the gravity measurements and seismic measurements of overland traverses, notably that of the Commonwealth Trans-Antarctic Expedition. All have to be assimilated and studied.

Some achievements can, however, be mentioned. The creation of an observational network covering the Antarctic region has made it certain that new knowledge of Antarctic meteorology has been obtained and that from this we can deduce much about the atmospheric circulation in high southern latitudes. This knowledge could have an important impact in southern hemisphere weather forecasts and also provide a measure of the influence of the coldest region on earth on world weather. The world record low temperature of 1–24°F. was made on 17th August, 1958, by Soviet scientists 400 miles from the South Pole

Antarctic seismic sounding measurements have caused a revision of the estimated amount of ice in the world. The pre-I.G.Y. figure was 3,240,000 cubic miles. The I.G.Y. programme in glaciology is making a world census of the ice cover. Antarctica accounts for 90 per cent of it. There the new measurements have discovered ice thicknesses of up to 14,000 feet and the new estimate is 4,500,000 cubic miles, an increase of about 40 per cent. In the unlikely event of this melting into water, vast land areas in the world would be submerged. These seismic measurements of ice thickness are still coming in from traverses which have been made. Some show that the base of the ice is below sea level in many places. Perhaps the 'continent' below the ice is not a continent but a group of islands? We must await the study of results before we can answer the question, but I should like to draw attention to some work reported in a letter published in *Nature* (Vol. 183, p. 306) on 31st January, 1959, from F. F. Evison, C. E. Ingham and R. H. Orr of the Department of Scientific and Industrial Research, New Zealand. They point out that for all the established continents the thickness of the supporting earth's crust is 30–40 km. or more, whereas the thickness of the earth's crust in oceanic regions is 5–15 km. From records of shock waves from an earthquake on 9th September, 1957, which was centred in the south-east Indian Ocean (and another on 4th August, 1957, in the south-west Indian Ocean) and was detected both at the New Zealand observatories at Hallet Station and Scott Base and at the Russian Base at Mirny, these authors have concluded that the crustal thickness is 35 km., and that the existence of a true Antarctic continent is confirmed.

(c) *Ocean Studies*

Although man has sailed the oceans for centuries and the principal large surface current movements have been known for some time, the scientific study of the oceans is still a comparatively young subject. A full understanding of tidal and ocean waves deriving from a number of causes including interaction with the atmosphere, submarine earthquakes, etc., has yet to be achieved, and most of the I.G.Y. work has been devoted to this end. The installation of 50 tide gauges at many points, including some on oceanic islands, has been one of the principal means of acquiring automatic records that are yet to be studied. Records have also been made of the mean sea level. From previous mean sea record observations we know that the level of water in the oceans is rising as the Arctic becomes warmer and the glaciers recede. As the ice cover melts it lightens the load and the sea bottom begins slowly to rise, for example, in shallow northern

seas such as Hudson's Bay and the coastal areas north of Canada and Siberia. This also raises the mean sea level. This sort of change is of interest to others besides the scientist: for instance, the 6-inch rise per hundred years, which is the rise in the South of England, will necessitate higher sea walls to protect densely populated industrial areas situated below the level of ordinary spring tides. The new tide guages installed during the I.G.Y. are just the beginning of a search to detect and understand these changes.

The study of general circulation in the oceans is another important aspect of the I.G.Y. oceanographic programme, and here there have been a few dramatic discoveries about deep ocean currents. Eighty ships from 20 countries have taken part in I.G.Y. ocean surveys. Among British ships have been the R.R.S. *Discovery II*, Fishery Research vessels and H.M. Survey ships. Detailed studies have hitherto been somewhat difficult to make, but Dr. J. C. Swallow of the National Institute of Oceanography developed, just before the I.G.Y. began, an instrument which has greatly facilitated the measurement of ocean currents at all depths. This is the neutrally buoyant acoustic float, made of aluminium tubes, which are less compressible than sea water. When loaded it descends into the ocean, but as it descends to a depth where the water pressure makes the water outside the float more dense, the water inside is less dense, and so the float tends to gain buoyancy. The desired level for an investigation can be selected by adjusting the weight and thickness of the tubes, and as the instrument is completely free and buoyant at the selected depth it drifts with the current. Contained in the tubes are batteries and an acoustic transmitter, and as it drifts it sends out signals at regular intervals. The signals are picked up by a ship on the surface and the path of the float is plotted. This is usually done by having hydrophones fore and aft, so that when the signal arrives simultaneously at both the float is directly on the beam and its bearing is known. It is difficult to keep a sufficiently accurate record of the ship's movement, but this problem is overcome with the help of tightly anchored buoys or radio navigational aids, where available. In co-operation with U.S. oceanographers R.R.S. *Discovery II* has made a study of the Gulf stream in the area 32°–33°N. and 75°–76° W., that is, off South Carolina. At the surface there was a strong northwards movement, at 5,000 feet a little horizontal movement, but at 8,000–9,000 feet a counter current of up to $\frac{1}{3}$ knot towards the south was recorded. U.S. oceanographers working below the South Equatorial current in the eastern Pacific found a deep counter current with speeds of 1 to 2 knots, and collaborative work done by R.R.S. *Discovery II*, together with Norwegian and French vessels, has shown that in an area 400 miles west of Oporto and Lisbon deep current speeds range from 1 to 2 miles a day. Along with these measurements, temperature salinity, oxygen content, and other variables have been measured and it appears that deep water movements carry as much water as surface currents. Further work will be done to seek a better understanding of the effect of these movements on climate and fisheries. I might also mention that dumping of radioactive wastes in the sea might have consequences not foreseen in the absence of such knowledge of deep water movements.

Several new submarine topographical features have been discovered in the oceanographic work and a region rich in minerals found in the South-East Pacific (the value is estimated at hundreds of thousands of pounds per square mile). In this subject we have an example of how, when the inquirer is seeking the answer to one question, several more questions present themselves. The I.G.Y. has given ocean studies a big boost and we can confidently expect great advances in the next decade.

(d) *The Earth's Atmosphere*

I have briefly mentioned meteorology, which we investigate by using balloons; to reach out farther we send rockets and artificial earth satellites, and now, just after the end of the I.G.Y., two artificial planets have begun to orbit the sun. Rarely can there have been such a rapid development of a new scientific technique with consequences so important, inasmuch as man's entry into space opens up new horizons in understanding the forces which act over our planet and the universe around it.

Upper atmosphere research with rockets began in the U.S.A. soon after the end of the war as a consequence of the V2 rocket activities of the Germans. Until recently little was known of Soviet rocket activities, but we now understand that they began in 1949. During the I.G.Y. over 200 rocket launchings took place, and in addition to the U.S.A. and the U.S.S.R., Canada, Australia, France, Japan and this country took part. The British 'Skylark' rocket programme has been co-ordinated in this country by a Royal Society Committee. The firings have been carried out by the Ministry of Supply at the Woomera range in Australia, the only permanent range in the southern hemisphere. The planning of the programme began four years ago and it has progressed in a very satisfactory manner. The 'Skylark' has proved to be a very reliable rocket and there has been a successful programme of launchings, carrying instruments, some of novel design, to heights up to 100 miles, providing direct measurements of temperature, pressure, wind movements, ion density, and the impact of micrometeorites during flight. Either the rocket carries equipment to send radio messages of some of the measurements it makes, or measurements are made by ground-based observations. Already valuable results, some of them of an accuracy not achieved in other rocket research programmes, have been obtained, and the programme is to continue with rockets carrying additional experiments, e.g., measurements of the magnetic field, to greater heights. Much further study at heights below that in which artificial satellites can operate (150 miles) still needs to be done. The development of the airborne instruments and the devising of the experiments provide the right kind of experience in this country for satellite experiments, should such a possibility come about.

The proposal that an attempt should be made to launch an artificial earth satellite was made at an I.G.Y. preparatory conference in Rome in 1954, and some months later President Eisenhower announced that the U.S.A. would attempt to do so during the I.G.Y. In 1956 the Soviet Union indicated the intention of their scientists to do so. It is now an important fact of history that

on 4th October, 1957, when the I.G.Y. was just three months old, the Soviet Union successfully placed such a satellite into orbit, to the astonishment and admiration of the whole world. Sputnik I, as it became to be known, was a sphere containing a radio transmitter using wavelengths of 20 M/c and 40 M/c. Even if it had contained no transmitter much valuable information could be obtained from observing the satellite and determining its orbit. If there were no atmosphere and the earth were a perfect sphere, the orbit of a satellite not too remote from the earth's surface would be an ellipse of a fixed size and this would be in one fixed plane. Observation has shown that the elliptical orbit does change in size and the plane of the orbit rotates slowly about the earth's axis. The change of orbit is due to atmospheric drag which makes the ellipse more circular, and the rotation of the orbital plane is due to the equatorial bulge or the extent to which the earth's shape departs from that of a perfect sphere. Observations on Sputnik I and its successor satellites have shown that the earth's atmosphere is denser than we thought previously and that there is a greater flattening at the poles than we had calculated before the I.G.Y.

Although there are at present only two countries which launch satellites, there is nothing to prevent scientifically advanced countries from making observations of them if they pass overhead. This can be done by three principal methods. First, by visual and optical observation; second, by radio echoes bounced off the satellite; third, by radio reception if the satellite carries a radio transmitter. In all three methods British scientists, at home, at Singapore, and in Nigeria, have been very active and this observational programme is being co-ordinated in the Royal Society. In the optical field there are 28 observing stations. The satellite can only be seen when the observer is in the shadow cast by the earth on sunlight and the satellite itself is in the sunlight. The U.S.A. satellites are out of range of our observers and it is only when there have been favourable orbits of the Sputniks that observation has been possible, and then only if there was no cloud cover. The instruments used are telescopes (which are employed by the 'Moonwatch' teams of the British Interplanetary Society), specially designed cameras, kinetheodolites or photo-electric devices. Valuable help has been given by amateurs. The British kinetheodolite observations carried out by the Ministry of Supply are regarded as being among the most accurate achieved so far. A promising sensitive photo-electric instrument is being developed by Dr. A. P. Willmore at University College, London. For radar observation the Manchester University Jodrell Bank steerable radio telescope, suitably adapted, puts us in a very favourable position, as no other instrument with its capabilities yet exists anywhere else. This country has always been in the forefront of scientific radio observations, and in the radio observation of satellites there are 10 stations. Very valuable records have been obtained from Sputnik transmissions. Those on Sputnik I and Sputnik II lasted only a few weeks but Sputnik III, being equipped with a solar battery, a device which uses the sun rays to generate power for the radio transmitter, may well continue to transmit until it falls back into the earth's atmosphere. Our radio scientists have organized the observation of certain key transits.

The Radio Research Station of the Department of Scientific and Industrial Research now operates a Prediction Service and gives information on the orbit forecasting the appearance of the satellite. As these satellites have travelled outside the electrically charged layer, the ionosphere, much has been learned about the ionospheric behaviour by receiving radio messages through it. Our radio scientists are obtaining interesting results in this way. From the foregoing it will be evident that Great Britain is already an active participant in satellite research. The later satellites carry instruments to make measurements of various kinds, such as those made by rocket instruments, temperature, pressure, magnetism, ion density, micrometeorites, cosmic rays, the nature of the solar spectrum, and so on. Sputnik II carried the bitch Liaka, and her physiological behaviour was carefully recorded. These measurements are coded into radio transmissions which are received and analysed by the observers on the earth's surface. The correct interpretation of many such messages can only be done satisfactorily by the launching country. By the I.G.Y. agreement results are to be placed in World Data Centres (one of which is at our Radio Research Station at Slough) and this is being done both by the U.S.A. and the U.S.S.R. A great deal of new knowledge is being obtained.

The most exciting discovery of the I.G.Y. rocket and satellite programme has been that first reported by Dr. James A. van Allen and colleagues and now supported by evidence from Sputnik III. This was the discovery of an intense radiation belt which is trapped in the earth's magnetic field and has been given the name of the Van Allen Radiation Belt. The discovery was made in Explorer I, when Geiger counters to record the cosmic radiation soon became saturated with intense radiation. Later satellites—Explorers III and IV—carried a special instrumentation to investigate this radiation further. This consisted of a series of counters whose measurements were recorded on magnetic tape which could be read out on radio command from the ground. The U.S.A. moon rocket programme provided an opportunity for further research into this new phenomenon, and suitable detectors were calibrated on the basis of the results from the Explorers. In *Nature* of 14th February, 1959 (Volume 183, p. 430), James A. van Allen and Louis A. Frank have described the results they obtained from Pioneer III on 6th December, 1958, and they show that there appear to be two distinct widely separated zones of high intensity. This discovery is a challenge to the theoretical scientists and has given rise to much discussion and tentative revision of cosmic physics.

The period of the I.G.Y. was no sooner ended when, on 2nd January, 1959, Moscow radio announced that a multi-stage rocket was already *en route* to pass in the vicinity of the moon. It passed within 5,000 miles of the moon's surface early on 4th January, having travelled over 220,000 miles in 34 hours. By 8th January this new instrument was 750,000 miles away and began to travel round the sun in a planetary orbit of its own. It will take 450 days to complete a single orbit. The near approach to the moon was a remarkable bit of shooting. It has been said that to hit the moon, which is 2,160 miles in diameter, would be more difficult than scoring a bull's eye on a moving object from a gun mounted

on a fast-moving vehicle. The radio guidance control from the ground therefore was of amazingly high accuracy. This guided missile had sufficient velocity as it passed the moon not to be greatly disturbed by the moon's gravity pull. As a means of optically checking a point in its trajectory, 2 lbs. of sodium were evaporated at a very accurate time interval after launching, controlled by a quartz clock. The evaporated sodium produced a large cloud which glowed in the sunlight, like an artificial comet, and was seen and photographed by specially designed cameras. The time was selected so that the cloud could be observed at night-time by the largest possible number of Soviet observing stations. Soviet scientists report that this experiment went precisely according to plan, and it may well be used in future as a standard method for checking trajectories of space probes. At 300,000 miles the Soviet space probe passed out of radio range. The last stage rocket carried several instruments, including the sodium ejection device, cosmic ray counters and a hermetically sealed sphere which contained further instruments and two radio transmitters. Radio messages giving observations were received and recorded on magnetic tapes and films at the ground stations. Soviet scientists have already stated that much information has been collected about the cosmic radiation, magnetic fields of the earth, moon, and in space, as well as the micro-meteoric dust in interplanetary space, and possibly it will provide the verification or refutation of a new theory that the earth is simply a speck enveloped by the sun's own atmopshere. An early scientic report from the Soviet Union on this information has been promised. Last week's successful flight by the U.S.A. Pioneer rocket will be familiar to you, and this too will yield valuable results.

Who can doubt that these first journeys into interplanetary space are just a beginning? What new discoveries lie ahead? Actual landings on the moon and the nearest planets with scientific instruments and even by man himself cannot be very far away. The I.G.Y. of 1957–8, when viewed half a century from now, will be seen as a fumbling first attempt by man to understand the physical environment of his own planet in relation to the sun, its family of planets and to the galaxies of the universe.

### THE LEGACY OF THE I.G.Y.

I have tried to indicate some of the facts of the I.G.Y. and some of the ideas which are emerging as the facts are being studied. If I have done this properly, you will not be surprised that the momentum of the enterprise is not to be wasted. Arrangements have been made to continue part of its programme during 1959. The example of the I.G.Y. is already also being followed in several specific fields. The International Council of Scientific Unions has appointed a Committee on Space Research using an organizational pattern similar to the I.G.Y. It held its first meeting at the Royal Society in November, 1958, and its second meeting begins tomorrow at The Hague. Its President is Dutch, and of its two Vice-Presidents one is American and the other is from the Soviet Union. I am confident that where, so far, the United Nations has failed, the new international committee for space research will succeed in its object to bring about world

co-operation. It will be concerned with the scientific aspects of this subject and not with regulation and control.

The great Antarctic effort will continue under the auspices of the international Special Committee for Antarctic Research which has just concluded its third international meeting in Canberra. To provide the national link in this country the Royal Society has appointed National Committees for Space Research and Antarctic Research. Both have recently started their work. Oceanic research too is to have an international Special Committee with a family of national members. Also being discussed is a proposal for a World Magnetic Survey at the next period of sunspot minimum in 1962–3, that is, when magnetic storms caused by the sun will be fewer. These projects then form a part of the legacy of the I.G.Y. It is not perhaps too much to say that the I.G.Y. is the greatest single achievement of organized science in history and I should like to end by quoting the words of the Indian geophysicist, Professor K. R. Ramanathan, speaking at Toronto in September, 1957: 'The I.G.Y. . . . has involved the bringing together of workers of many nations with differing ideologies and in varying stages of scientific development. A keen diligent observer with modest education in any corner of the world has a respected place in the I.G.Y. scheme. The approach is human and earthy, and the potentialities for the unification of mankind are infinitely great.'

In the writing of this paper I wish to acknowledge the very considerable assistance I have received from many international and national sources, especially Professor S. Chapman, F.R.S., President of the I.G.Y., Dr. Hugh Odishaw of the National Academy of Sciences, Washington, the British National Correspondents, especially Dr. G. E. R. Deacon, F.R.S., Director of the National Institute of Oceanography, Professor M. A. Ellison of the Dublin Institute of Advanced Studies, Professor H. S. W. Massey, F.R.S., of University College, London, Mr. J. Paton of the Balfour Stewart Auroral Laboratory, University of Edinburgh, and also members of the staff of the Royal Society.

## DISCUSSION

MR. P. K. SHAHANI: Does the lecturer feel that there is a call for providing a scientific service for distilling, processing, assimilating and publicizing the data which the Geophysical Year is providing?

THE LECTURER: There is a service in being already. We have the World Data Centres at which the data are collected, and where they are reduced to a form that can be published in the *Annals of the I.G.Y.* The International Council of Scientific Unions has made plans for this to be done.

DR. A. M. YOUNG: Has the success of the I.G.Y. stimulated the provision of more money than they began with for these future plans?

THE LECTURER: The question of money is very much one for the Treasuries of the various countries, but I think it safe to say that the I.G.Y. has induced a much greater awareness of the need for money for this kind of scientific experiment, and that it will be more easily forthcoming than it was three or four years ago.

MR. CADNESS PAGE (Librarian, Harrods Ltd.): As a matter of general rather than

scientific interest—did the Soviet Government provide us with the key to understand the transmissions from their satellites?

THE LECTURER: Certain deductions from transmissions that I mentioned can be made simply by observing them. Soviet scientists told us the wave-lengths they were using. Certain other observations which are made can only be interpreted by the launching country, inasmuch as they have calibrated the instruments used. We have had a code which enables us to interpret the cosmic ray observations that we have made. But to be really reliable I think such observations have to be referred back to base, and we have to wait for further reports from the launching countries.

THE CHAIRMAN: We have had a whole cornucopia of ideas to-day; we have had presented to us the record of work of an intricate and varied character, over a very long period of time. I am well equipped to understand the period of time over which this work has been spread because, as President of the Geographical Association (in distinction from the Royal Geographical Society) I was honoured by being given the opportunity of taking the chair at the initial lecture that Dr. Martin gave when the International Geophysical Year was still a matter for the future, or rather when it was just in embryo. That was in January, 1957. He has had a good deal more material to deal with to-day, because then it was prophecy and foresight; now he is recording in brilliant fashion what has actually been achieved from those first beginnings. Let us congratulate Dr. Martin and thank him for the extraordinary exertions by which he has compressed within little more than an hour the exercises of so many nations over so long a period of time in such varied regions and for such various purposes.

*The vote of thanks to the Lecturer was carried with acclamation, and the meeting then ended.*

# THE HISTORY OF THE AFRICAN PYRETHRUM INDUSTRY

*A paper by*

*T. F. WEST, D.Sc., Ph.D., F.R.I.C., A.M.I.Chem.E.,*

*European Operations Executive, African Pyrethrum Technical Information Centre Ltd., read to the Commonwealth Section of the Society on Tuesday, 10th February, 1959, with Sir Ian Heilbron, D.S.O., F.R.S., Professor Emeritus of Organic Chemistry, University of London, in the Chair*

THE CHAIRMAN: It is my privilege this evening to introduce to you my friend and wartime colleague, Dr. T. F. West. In doing so, I am very glad to have the opportunity of expressing my indebtedness to him for the help he invariably gave me in my capacity as Chairman of the Insecticides Research and Development Panel during those difficult wartime days when we were seeking substitutes for pyrethrum to protect our troops in North Africa, and later in Burma, against the onslaught of mosquitos, flies and other insects. I have known Dr. West since 1938 when, in association with the late Dr. A. E. Gillam, who was at that time a member of my staff in Manchester University, he carried out important spectrographic work which threw new light on the detailed chemical structures of pyrethrins I and II, the toxic principles of pyrethrum flowers.

The subject which we are going to hear about is one of wide interest and importance, and one on which Dr. West is well qualified to speak, not only from the point of view of research but also from his knowledge of the industrial applications of pyrethrum flowers.

*The following paper, which was illustrated by lantern slides, was then read:*

## THE PAPER

East Africa is to-day the principal source of the world's supply of pyrethrum and yet less than thirty-five years ago the flower did not grow in that area. The cultivation of pyrethrum on an increasing scale in these territories and the success of the industry has been due to close collaborative effort in the fields of science and practical farming.

It would be as well to spend a few minutes in establishing the position of pyrethrum in the world as it was when Kenya first came into the picture in the 1930s and the industry in East Africa began to take shape. In 1851 Koch stated, for what appears to be the first time, that the celebrated Persian insect powder consisted of a mixture of *Chrysanthemum roseum* and *Chrysanthemum carneum*. It is said that early in the nineteenth century an Armenian merchant travelling in the Caucasus discovered that insect powder consisted of these flowers, developed manufacture and began exporting to Western Europe in about

1820. The discovery and early commercial development of powders based on *Chrysanthemum cinerariæfolium*—from which the Dalmatian insect powder was prepared—is equally obscure. De Visiani in 1854 mentioned the use of this plant as an insecticide, but the inhabitants, in order to keep production to themselves, baked seeds supplied for cultivation elsewhere to prevent germination; in this account the term pyrethrum is applied to *Chrysanthemum cinerariæfolium* since, although other pyrethrin-containing plants—notably *Chrysanthemum roseum* and *Chrysanthemum carneum* do exist—they are not now of commercial interest. Importation of flowers from Europe (Dalmatia) to the United States—now by far the largest consumer—began about 1885. Pyrethrum was introduced experimentally into Japan in 1881. Serious cultivation began in 1886 and extended until, when the supply from Europe was cut off during the 1914–18 war, Japan became the principal world source.

Coming now to the origin of the African pyrethrum industry, the following account is based on notes supplied by Dr. J. R. Furlong, a colleague on the staff of the Pyrethrum Board of Kenya, and comments on these notes by Dr. F. Tattersfield and Dr. J. T. Martin. It will be recalled that Dr. Furlong was for many years Chairman of the Consultative Committee on Insecticides of Vegetable Origin at the Imperial Institute. There were in fact two lines of origin behind the African production of pyrethrum. One through Captain Gilbert Walker and the Imperial Institute and the other through Mr. V. A. Beckley (Senior Agricultural Chemist to the Government of Kenya) and Sir John Fryer, the latter working at the Plant Pathology Laboratory of the Ministry of Agriculture at Harpenden in close association with Dr. Tattersfield of the Rothamsted Experimental Station.

FIGURE 1. *Chrysanthemum cinerariæfolium*

In the early 1920s Fryer and Tattersfield commenced a search for a safe alternative to lead arsenate, which was becoming widely used for the control of caterpillars attacking soft-fruit trees. Thus it came about that as early as 1924 Sir John Fryer was exploring the possibility of growing pyrethrum in the United Kingdom, and in the late summer of 1924 he obtained seed of Swiss origin (from plants grown at the Station Viticole, Lausanne) from M. Vayssière of the Entomological Station, Paris. Messrs. A. Joensson and Co. of Kobe also suggested to Fryer that pyrethrum might be successful in England and sent him a supply of Japanese seed early in 1925. The Swiss seed was sown in September, 1924, and the seedlings were planted out in April, 1925. The plants were placed in a sheltered bed in the garden of the Ministry of Agriculture at Harpenden. It was from this source that Mr. Beckley, having recognized the value of pyrethrum as an insecticide, obtained seed in 1929, having applied unsuccessfully in 1927. This seed was sown in the nurseries at the Scott Agricultural Laboratories in Kenya and, by August, 1930, the first flowers were collected, and found to have a pyrethrin I content of 0·5 per cent. Thus encouraged, Beckley proceeded to ascertain the general suitability of the crop for varying conditions in Kenya, and distributed in due course small quantities of seed to as many farmers as possible. The seed was from his own raising, supplemented in 1931 with a further supply of several pounds from Harpenden.

The other line of progress also dates from 1927, when Captain Gilbert Walker wrote to the Imperial Institute on the subject of pyrethrum as a possible crop. Walker was continually in contact with the Imperial Institute, both by correspondence and by periodical visits. In the words of Dr. Furlong:

> He was an enterprising settler with a scientific approach and always ready to experiment with new crops. Later in 1927 he visited the Imperial Institute, when the definite recommendation was made to him to investigate pyrethrum growing in Kenya as the Japanese were finding it a very profitable industry. I had many talks with Chandler (the late Dr. S. E. Chandler) on the part the Imperial Institute had played in the introduction of pyrethrum to Kenya and, although he never said so, I am certain that he was the actual person who made the recommendation to Walker. From this interview Walker went away and proceeded to obtain seed from Dalmatia, through, I believe, his brother who was in Dalmatia. He obtained his seed some months ahead of Beckley's supply from Harpenden. By 1928 Walker had established his plants, a year ahead of Beckley, and in 1929 sent his first sample of flowers to the Imperial Institute for analysis, and he was producing both flowers and seed when, as a result of Department experiments, it had been shown that pyrethrum was successful at altitudes above 5,000 feet in the Kenya Highlands, and encouragement was being given to the new crop. Beckley, Tattersfield and Chandler acclaim Walker as the first grower of pyrethrum in Kenya and the founder of the industry. In its expansion, his contribution of supplying seed from acclimatized strain was most important.

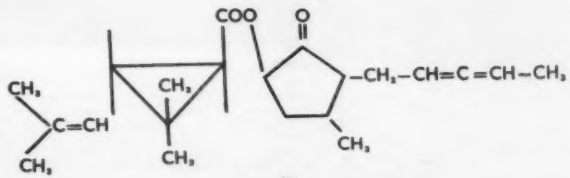
Prior to the growing of pyrethrum locally, Kenya had relied on Japan for supplies, which were used as a powder or a 'paraffin' solution made locally by the Oil Companies generally for insecticidal purposes. With the advent of home-grown material, which for the first few years was all absorbed locally, more

FIGURE 2. *First plot of pyrethrum flowers grown from Swiss seed in the garden of the Plant Pathology Laboratory of the Ministry of Agriculture at Harpenden.* (*Photograph taken in 1925.*)

attention was given to the field of application. It was here that Dr. R. H. Le Pelley (Senior Entomologist, Department of Agriculture, Kenya) played a part in developing a technique for the use of pyrethrum against coffee pests, planters having found that pyrethrum was successful against the coffee capsid bug (*Lygus Coffeae*, China) and the variegated coffee bug (*Antestia lineaticollis*, Stahl).

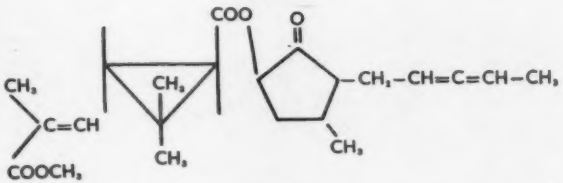
At the beginning of this lecture reference was made to the part played by the application of science in building up the new industry in Kenya. The development of methods of analysis and gradual understanding of the properties of the insecticide were made possible at this critical period by the classical work of the Swiss chemists, Staudinger and Ruzicka. In 1924 a series of papers appeared describing the work carried out by these authors during the years 1910–16. The insecticidal constituents of pyrethrum, pyrethrins I and II, were then defined as pyrethrolone esters, respectively, of chrysanthemum monocarboxylic

acid and the monomethyl ester of chrysanthemum dicarboxylic acid having structures I and II.




(I)

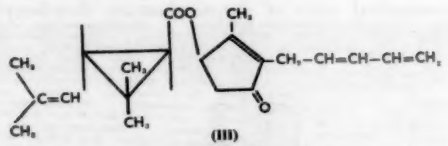
Staudinger and Ruzicka 1924



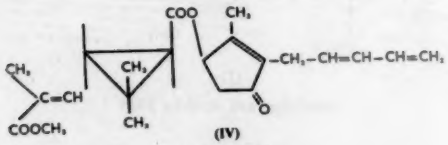

(II)

Staudinger and Ruzicka 1924

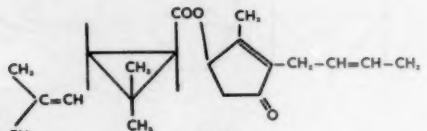
While the broad conclusions of Staudinger and Ruzicka have not been disproved, subsequent work by Gillam and West in this country and by Haller and Laforge and their collaborators in the United States led to some modifications in these structural formulae, and in 1945 Laforge and Barthel isolated a second alcohol, cinerolone, which is present in pyrethrum flowers in the form of esters (cinerins I and II) with the same chrysanthemum acids already known in combination with pyrethrolone as pyrethrins I and II. Suggestions have been made from time to time that the flowers contain other toxic constituents, but in my opinion there is little evidence in support. Careful spectroscopic examination of all the fractions and residues obtained during the purification processes involved in the preparation of pyrethrin concentrates failed to disclose the presence of any new substance possessing characteristic absorption bands in ultra-violet light. This result would not, of course, exclude the presence of an active substance transparent to ultra-violet rays, or as mentioned by Professor J. W. Munro as early as 1942, the presence in different samples of pyrethrum flowers and extracts of other substances, transparent to ultra-violet rays which, although themselves biologically inactive, assist in increasing the efficacy of the pyrethrins. Thus, summarizing the position as it stands to-day, the active principles which are usually referred to collectively as pyrethrins have structures III to VI.



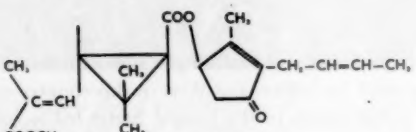
(III)
Pyrethrin I.



(IV)
Pyrethrin II.



(V)
Cinerin I.



(VI)
Cinerin II.

S. H. Harper has pointed out that the chrysanthemum acids appear to be unique among natural products in containing an unfused cyclopropane ring, and considered that this might suggest a possible origin in the fission of suitable dicyclic monoterpenes containing the fused cyclopropane ring. If this were the origin of the chrysanthemum acids then the presence of a carene or related terpene might be expected in the essential oil removed from the flower by steam distillation. However, Merritt and West examined the oils obtained from Dalmatian, Kenya and English grown pyrethrum flowers without detecting the presence of such terpenes.

It is now possible to return to consideration of the work in hand at Rothamsted at the time of the experiments being undertaken in Kenya by Captain Walker and Mr. Beckley. In addition to the Harpenden plot, similar small plots were set up at Kew, Wisley, Wye, East Malling, Swanley, Lewes, Reading, Sparsholt, Long Ashton, Seale Hayne, Isles of Scilly, Aberystwith, Wisbech and Denham.

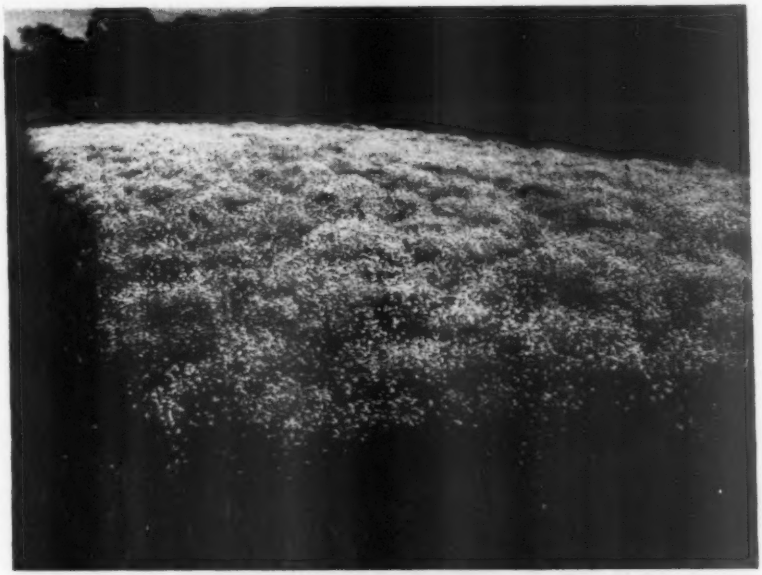


FIGURE 3. *Experimental bed of pyrethrum flowers grown at Woburn, Beds. (Photograph taken shortly before harvesting the flowers in 1935)*

The average yield of air-dried flowers from these plots in 1927 was equivalent to 5·5 cwt./acre. Larger experimental plots, half an acre in area, on different soil types were set up in 1929 at Long Melford, Wye, Swanley and Kemerton, and in 1930 at Elveden and Thetford. Yields again were of the order of 5 cwt. of flowers per acre. C. T. Gimingham, who had joined Fryer from Rothamsted in 1927, was responsible for these experiments and kept detailed records of costs and returns. Analyses of the flowers from the plots by the newly-developed acid method showed they were of high quality; those from Kemerton and Swanley in 1930 contained over 2 per cent total pyrethrins. The investigations undertaken arose largely from reports from Gilbert Walker, by letter and periodic visits, of the progress of the new venture and the problems facing it. Tattersfield, who had established a close personal bond with Walker, set out to help as much as possible, and this is reflected in the botanical and agronomical nature of much of the work. It had become an established convention to regard as good samples only those containing flower buds in an almost closed condition. In 1931 Tattersfield published the results of a quantitative study of the development of the flowers. This was started in 1928 with the planting of a bed of 108 plants, raised from seed. He found that the content of pyrethrins rose to a maximum at the maturity of the flowers. This was of the greatest economic value, since not

only the percentage content of the flowers, but also the yield of flowers per acre, was markedly increased. Early in 1930 Tattersfield was joined by J. T. Martin in work on pyrethrum. The acid method of analysis of Tattersfield, Hobson and Gimingham, the reduction method of Gradinger and Corl in the U.S.A. and the French method of Ripert had just been published. These permitted fairly rapid chemical assessment of the quality of the flowers in place of the laborious biological testing used earlier, and opened the way to many investigations. These included an examination of the effects of manurial conditions, in pot and field experiments, upon the yield and quality of the flowers, of the factors underlying the loss of activity of the flowers, and of the stabilization of dusts and extracts by the use of antioxidants such as hydroquinone. Experiments were carried out with S. G. Jary of Wye College on the optimum conditions for the artificial drying of the flowers. Reports from Kenya and from other countries where attempts had been made to establish the crop showed that the plant would grow well and produce flowers of high insecticidal activity in tropical regions of high altitude but that, in lower regions, the morphological character of the plant was changed and few or no flowers were produced. This was investigated by Tattersfield and Martin at Rothamsted, who showed the necessity of a dormant period for the successful flowering of the plant. Fryer and Martin in 1931 also commenced a cross pollination experiment which lasted four years in an attempt to combine high pyrethrin content with a large weight in flower head. Two plants from the bed started in 1928 by Tattersfield were used as parents; one of these (F 11), yielding flowers with over 2 per cent pyrethrins, was propagated by splitting to serve as a later source of seed for Kenya and other regions overseas.

In commenting on the notes which I read earlier from Dr. Furlong's draft, Dr. Tattersfield wrote:

> I knew most, if not all, of the original workers and there is little doubt that Gilbert Walker, with whom I was on the closest terms of friendship and who wrote me frequently and visited me whenever he was in England, was the first man to plant pyrethrum in Kenya, and there is little doubt that Dr. Chandler had advised him, although the latter rarely, if ever, hinted at it . . . I might say that in 1935, when in America as guest of Mr. Penick, the Plant-Drug Manufacturer, I mentioned in an address to a large Conference at Chicago of scientists and others interested in insect control measures that Kenya pyrethrum flowers of high quality were likely to be available in a short time. It aroused the greatest interest. . . .

On 18th January, 1933, twelve growers of pyrethrum met at the Nakuru Hotel, when Captain Gilbert Walker pointed out that by 1934 production of flowers would probably be in excess of local demand and that an export trade should be inaugurated. At this distance in time it is amazing that some doubt as to the necessity of forming an association was at first expressed, but it was finally accepted that a representative organization was essential to protect the interests and to steer the development of the new industry. According to the Minutes recorded at this Meeting, nine of the growers present voted in favour, while three abstained. Thus the Kenya Pyrethrum Growers' Association was

formed and Nakuru became the home and centre of the African pyrethrum industry, a position which it still holds to-day. In 1933 the production of flowers was estimated at 15 tons and progress was rapid, and in 1935 'An Ordinance to regulate the Sale and Distribution of Pyrethrum grown in the Colony' became law and it gave the Governor in Council power to appoint an agency (i.e., the Pyrethrum Board) which had the exclusive right to purchase pyrethrum from growers, and to sell in any market, but 'its first duty shall be to supply the demands of the Colony and other East African territories to the Satisfaction of the Governor'.

FIGURE 4. *Picking pyrethrum flowers in Kenya*

It is of interest to recall at this point that, although kerosine extracts of pyrethrum were recommended for controlling insects on plant more than 60 years ago, it was not until the 1914–18 war that such products were offered commercially. As late as 1926 a U.S. Patent was granted protecting the manufacture of a liquid household insecticide consisting of a solution in a mineral oil such as kerosine of the 'volatile active principles of pyrethrum flowers'. In the litigation which followed the Patent was held invalid and it was proved that such products had been used in the U.S. Navy during the war. It is surprising, in view of the diversity of pyrethrum extracts and products now available,

that up to 1920 the material was used almost invariably as a powder. Pyrethrum was by the early '30s becoming increasingly widely used, and kerosine solutions were employed extensively as household insecticides in addition to the established uses of pyrethrum powders against various pests. It was in 1934 that Potter began the work which demonstrated the satisfactory control of stored product pests in warehouses by sprays and films of pyrethrum in heavy oil. Thus an expanding market awaited the new East African industry when from 1935 flowers, more potent than any previously seen in commerce, became available for export.

On 21st July, 1936, Rules were issued as Kenya Government Notice No. 454. These rules required all growers to register with the Agency and each grower to submit a return of acreage under pyrethrum, and the estimated weight of flowers he anticipated picking, but it did not give the Agency the right to determine a grower's acreage. The system of licensing growers and controlling production became operative through further statutory powers, afforded by the 'Pyrethrum Ordinance 1938' under which a new Board replaced the original 'Advisory Board' which functioned under the Ordinance of 1935. The third and current version of the Ordinance was promulgated in 1956.

Mention should be made here of the early provision which the Kenya Department of Agriculture undertook for the new industry. In 1937 research on high toxic strains was in progress at the Njoro Plant Breeding Station, and subsequently four specific pyrethrum stations were established which are now in the charge of Dr. U. Kroll, who has recently reviewed the breeding of improved pyrethrum flowers. The importance to the farmer of growing pyrethrum varieties with a high insecticidal content is clear, since payment is based on the amount of pyrethrins delivered. Two main bud and flower diseases are known to influence the yield. One is caused by the fungus, *Ramularia bellunensis*, while the other is of a purely physiological nature, probably the result of a certain weakness in the plant, about which little is known. At present no really effective fungicide is known; therefore selecting and breeding for resistance are considered the most promising to combat the pest. In order to initiate bud production a certain degree of chilling is required. The chilling requirements differ between individual plants and varieties (hybrids) and in order to ascertain the optimal conditions for their flower production a series of research stations has been established in Kenya at altitudes of 7,000, 7,800, 8,200, and 9,100 feet respectively. Another peculiarity of the pyrethrum plant is the variation in total pyrethrins content as well as in the pyrethrin I: pyrethrin II ratio which often occurs from picking to picking. Work now in progress, however, is shedding more light on the relative insecticidal efficacy of the different constituents and future work lies in the production of varieties with predominantly the one or the other of the pyrethrins for specific insecticidal purposes. It is possible that polyploid plants may have distinct advantages. The inducement of polyploidy artificially by treating the seed or seedlings with the alkaloid colchicine has so far proved unsuccessful, but natural polyploids occur as mutations within collections of hybrids. Two triploids have recently been observed, one in the Belgian Congo and the other at Molo, and

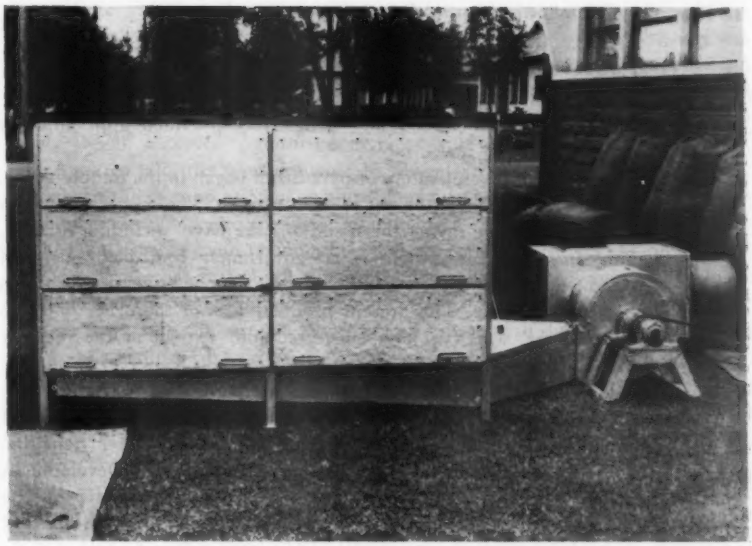


FIGURE 5. *Recently developed dryer for pyrethrum flowers*

both excel in the size of their flowers and have a high pyrethrin content. In the Belgian Congo plant breeding research is carried out at the I.N.E.A.C. (Institut National pour l'Etude Agronomique du Congo Belge).

The Minutes of the Annual General Meeting of growers of pyrethrum held in Kenya in May, 1937, show that the industry was then in a flourishing position, production and export for the past year being practically double that of the preceding one, and flowers were being sold overseas, principally to the United States on a Government Certificate of Analysis, provided by Beckley at the Scott Laboratories. The minimum price was stated to be thirteen-ninths of the price of Japanese flowers, based on Kenya flowers having a guaranteed content of 1·3 per cent pyrethrins against 0·9 per cent for Japanese flowers; it was expected that a higher return would be obtained by the selling agents, as the Kenya flowers were showing higher figures than 1·3. Forward selling was now starting, and the Kenya produce was offering a successful challenge to the Japanese material. In 1938 the estimated demand for Kenya flowers was placed at 3,000 tons, subject to a gradual annual increase.

In Tanganyika the growing of pyrethrum began in 1937–8. There are two distinct and widely separated growing areas, one in the Northern Province on the slopes of Mount Meru and Mount Kilimanjaro, the other in the Southern

Highlands, some 600 miles away. The industry is on a much smaller scale than in Kenya, as the following figures for 1956–7 show:

| | |
|---|---|
| Kenya ... ... ... ... ... ... | 3,092·95 tons |
| Tanganyika, Northern Province ... ... | 488·60 ,, |
| Tanganyika, Southern Province ... ... | 289·93 ,, |

Thus of the total East African output, Tanganyika provided approximately 20 per cent.

In the Belgian Congo the cultivation of pyrethrum began in the middle 1930s, and production was stepped up in the war years by request. The area of cultivation is the higher altitudes around the northern end of Lake Kivu, including Ruanda. Unlike the industry in Kenya, there is no government-controlled board of supervision. Growers are members of the Société Coopérative des Produits Agricoles de Costermansville. The present production is of the order of 1,600 tons of flowers a year, which is now converted into extract at the recently completed Trapak factory in Goma.

By 1941, production having risen steeply, the desirability of restricting production was actually considered, but towards the end of 1942 the position had changed completely and Sir Ian Heilbron (then one of the three Scientific Advisers to the Ministry of Production) formed the Insecticide Development Panel in order to correlate the work of the various committees advising the three Services at that time. The Imperial Government made an urgent demand for increased supplies of pyrethrum, which was now to be classed a first priority crop, as the United States were pressing for a guaranteed supply for war purposes, and the requirements of the War Office had similarly risen. Japanese supplies were of course no longer available, and Kenya had become the main world source of flowers for the Allies, with minor quantities from Tanganyika, Uganda and the Belgian Congo. So important was the part played by pyrethrum in maintaining health conditions amongst the armed forces that the Ministry of Supply had taken over the regulation of sales. The provision of shipping space for flowers from Kenya now became serious, the Ministry of Supply having guaranteed to purchase the produce of up to 50,000 acres, until the end of 1947. Accordingly, on the advice of Sir Ian Heilbron an extraction plant was erected in Nairobi, by the Ministry of Supply, under the guidance of Messrs. Stafford Allen & Sons Ltd. It did not come into operation, however, until the latter part of the war, with a capacity which enabled only a part of the crop to be processed, the output of extract being sent to England. It is interesting to note that in the early days of the introduction of pyrethrum into Kenya Captain Gilbert Walker had suggested, in 1933, consideration being given to the local conversion of flowers to extract before exportation and that the Board again gave much thought to such a project in 1938, with the same result.

Prior to the intensive work on D.D.T. from 1943 onwards a great deal of work was carried out on pyrethrum in this country and in the United States. It was in 1940 that Eagleson made the extremely important observation that sesame oil, although not itself insecticidal, increased the biological efficacy of the pyrethrins against mosquitoes and flies, permitting considerable economy in formulations.

An examination of the constituents of sesame oil responsible led to the development of the widely used synergist piperonyl butoxide and the other compounds containing the methylenedioxyphenyl group. Up to about 1943 pyrethrum was used in the U.S. Army louse powder, and the study of this application broke new ground. It was found that ordinary pyrethrum powder (the ground pyrethrum flowers of commerce) was not particularly effective against the body louse. When, however, pyrethrum extracts were impregnated on to an inert filler such as talc, the powders were highly effective and, what was more surprising, by the incorporation of an antoxidant such as hydroquinone such powders remained reasonably effective even after being exposed, spread thinly on paper in the laboratory at room temperature, for 340 days. The interesting observation was also made that sesame oil was quite ineffective as a synergist in the louse powders but that *iso*butylundecylenamide was satisfactory.

With the end of the war, the Government's interest in the factory terminated, and it was acquired by private interests who continue to operate it. It was in July, 1946, that Mr. Norman Hardy was appointed to the newly created post of Executive Officer to the Board, the need for a full-time officer with executive duties directly responsible to the Board having become urgently necessary. Under the urgent demand for pyrethrum during the Second World War already mentioned above, the production in East Africa rose steeply from 2,869 tons in 1939 to 7,409 in 1945. After the end of the war, the industry received a sudden shock. In 1947 the United States released its wartime stockpile of flowers and

FIGURE 6. *Laboratories of the Pyrethrum Board of Kenya at Nakuru*

freon, required for the production of aerosols, became unavailable in the United States. These circumstances, and the spectacular advent of D.D.T. in the war years, all contributed to the sudden slump in the American market, and the year 1948 found the Board with a considerable surplus of flowers. Growers drastically curtailed their planting, and the production for 1948 and 1949 was 1,557 and 1,516 tons respectively, and fears for the survival of the industry were current.

In 1952 the practical application of scientific methods was placed on an expanding footing. In that year Dr. Furlong of the Imperial Institute and Dr. Potter of Rothamsted, on the invitation of the Colonial Office, arising from proposals by the Board, visited Kenya and Tanganyika and submitted a report on the industry. The implementation of this report, actively pursued by the Board, resulted in the building of Chemical and Entomological Laboratories at the centre of the industry, in Nakuru. For this purpose Dr. Furlong joined the staff as Scientific Adviser. It should be mentioned here that Mr. Beckley at the end of 1947 resigned from Government service to become the Board's first Scientific Adviser. The practical work which he had conducted for the Board continued to be carried out, however, at the Scott Laboratories, but financed directly by the Board. It was in this period that he re-examined the spectrophotometric method devised by Gillam and West for the determination of the

FIGURE 7. *Pyrethrum flowers growing at the research station maintained by the Kenya Department of Agriculture at Molo (8,200 ft.)*

pyrethrins, a step which enabled a rapid evaluation to be made of all deliveries from the growers who had hitherto been paid on the visual grading of flowers. This method has enabled 10,000 analyses a year to be made in this connection at an economic rate.

A new extraction plant has been erected at Nakuru by the Pyrethrum Board of Kenya and is thus owned by the growers themselves. The Board is at present endeavouring to foster a major development in the African pyrethrum industry, and the programme of investigations in its laboratories has been extended to cover the needs of consumers in providing advice to formulators of insecticides containing pyrethrum. This expansion has necessitated additional building and increases in staff. Dr. A. A. Goldberg has been appointed Director of Scientific Services and is responsible for the direction of the laboratories. The African Pyrethrum Technical Information Centre Limited has been established in Nakuru and has set up a European Centre in London. The service (in establishing which the pyrethrum producers in Africa collaborated) is based upon the

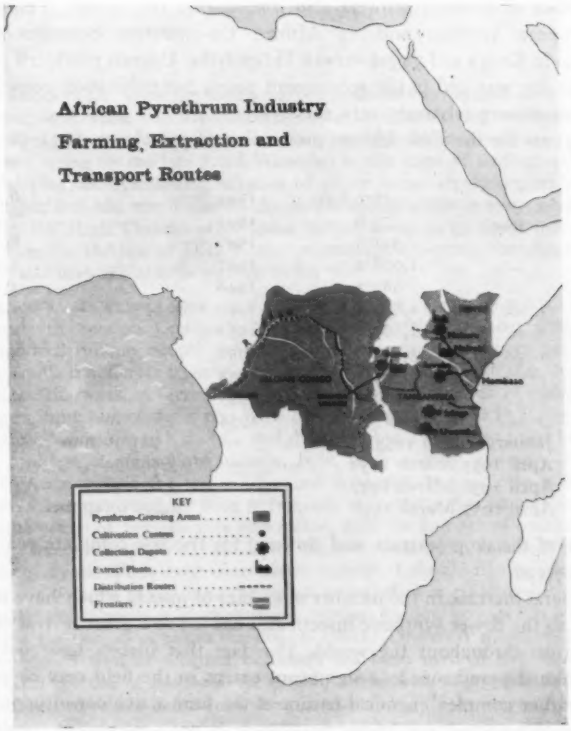



FIGURE 8

laboratories at Nakuru, where original work on new formulations is proceeding hand in hand with routine analytical control. Additional staff have recently been engaged to widen the scope of research, which now covers subjects ranging from grain protectants to the control of pests on coffee and the resistant blue tick on cattle. An important feature will be the endeavour to apply pyrethrum in new fields. To handle the latter in reference to temperate climates, provision has been made for biological research and application trials to be carried out at the University of Nottingham. The Technical Organization Scheme adopted by the Board in 1954 also provided for fundamental research to be carried out in this country. This is now in hand at the Tropical Products Institute and at Rothamsted Experimental Station. The funds for this work are being provided jointly by the Kenya Department of Agriculture and the Pyrethrum Board.

Africans have been growing pyrethrum in Kenya and Tanganyika for some years now, under the guidance of the Departments of Agriculture. The African-grown crop has increased from 82 tons in 1952 to 341 tons in 1957, and thus forms only a small part of the total production, which is still essentially European. The number of licensed growers also rose during the period. There are now 851 European growers and 13 African Co-operative Societies producing pyrethrum in Kenya and 96 growers in Tanganyika. Uganda produced pyrethrum during the last war and in the subsequent years, but cultivation ceased in 1952. The amounts were relatively very small.

The figures for the East African production of pyrethrum 1933–58 are given below:

| | | | |
|---|---|---|---|
| 1933–4 | 16·6 tons | 1944 | 6,547·1 tons |
| 1934–5 | 79·6 „ | 1945 | 7,409·0 „ |
| 1935 | 321·6 „ | 1946 | 6,740·1 „ |
| 1936 | 1,078·2 „ | 1947 | 3,906·9 „ |
| 1937 | 989·2 „ | 1948 | 1,557·17 „ |
| 1938 | 1,864·1 „ | 1949 | 1,516·8 „ |
| 1939 | 2,869·3 „ | 1950 | 2,176·23 „ |
| 1940 | 5,859·9 „ | 1951 | 2,229·85 „ |
| 1941 | 5,763·3 „ | 1952 | 2,737·23 „ |
| 1942 | 5,469·4 „ | 1953 | 2,319·12 „ |
| 1943 | 4,107·3 „ | 1954 | 2,549·71 „ |

| | |
|---|---|
| January/March 1955 | 921·36 tons |
| April 1955/March 1956 | 3,422·04 „ |
| April 1956/March 1957 | 3,871·48 „ |
| April 1957/March 1958 | 4,400·0 (approx.) |

The value of the crop (extract and flowers) for the last complete year 1957/58 was £1,507,126.

The general increase in the number of species of insects which have developed resistance to the newer synthetic insecticides has led to a great revival of interest in pyrethrum throughout the world. The fact that insects have not become tolerant toward pyrethrum to a significant extent in the field may be connected with the rather complex chemical nature of the four active constituents and the fact that under normal conditions pyrethrum is not a persistent insecticide, in contrast with many of the synthetic compounds. There is also an increasing

awareness of the need for legislation to control the residues of insecticides remaining on foodstuffs—from which pyrethrum is exempt in view of its lack of toxicity to warm-blooded animals. As I hope I have indicated, every effort is being made by the Pyrethrum Board under the Chairmanship of Mr. D. H. Pell Smith to make full use of these advantages of pyrethrum in building up still further this valuable industry. In this respect it is to be hoped that the results of the past will be repeated—at the beginning of this paper I said that the industry in Kenya was founded upon a close collaboration between farmer and scientist, and at this important stage in further development the farmers who control the Pyrethrum Board of Kenya are, as I have indicated, following this pattern.

I have referred, and gratefully acknowledge my debt, to Dr. J. R. Furlong, O.B.E., for providing the notes on which so much of this paper was based, and to Dr. F. Tattersfield, O.B.E., and Dr. J. T. Martin for most helpful comments.

The photographs of English-grown pyrethrum are reproduced by courtesy of the Rothamsted Experimental Station, and those of the pyrethrum industry in Kenya by courtesy of the Pyrethrum Board in Kenya.

## DISCUSSION

THE CHAIRMAN: Dr. West has kindly agreed to answer any questions on the subject of his paper, and while you are collecting your thoughts I might mention that the Insecticides Research and Development Panel to which Dr. West has referred was brought into being by the late Lord Waverley in the hope of finding some material to take the place of pyrethrum, supplies of which were largely denied us after the entry of Japan into the war. I should like also to mention that in 1943, when a request came from the High Command in India for someone to go from this country to instruct them on the use of D.D.T. and pyrethrum mixtures, the choice fell upon Dr. West, and very valuable he proved to be.

SIR SELWYN SELWYN-CLARKE, K.B.E., C.M.G., M.C., M.D., F.R.C.P. (Chairman, Commonwealth Section Committee): There are at the moment probably some eleven hundred million people exposed to malaria infection; every year there are about 200 million sufferers from malaria and about two million deaths. Now we have known since the work in Greece in 1951 that a certain number of malaria-carrying anophelines, four out of the sixty, have become resistant to D.D.T., and I believe also to other derivatives like B.H.C. and diazinon, but I think we must bear in mind the vast problem of controlling malaria. It is, as you know, the aim of the World Health Organization of the United Nations Assembly to eradicate malaria, so we must have something stronger than pyrethrum, something that has residual activity; this is quite essential, because it is impossible, with the amount of trained personnel, transport facilities and funds available, to spray mosquito infested houses more than once every month or even every three months. I should like to ask the lecturer this: is it not possible to combine the knock-down effect of the pyrethrum, which we all realize is very valuable, with that very important residual activity? Is it not possible to combine the two so as to get the double effect? Dr. West mentioned sesame oil as a synergist. I wonder whether patchouli has been used at all? Most of us are familiar with the use of patchouli oil in connection with scent, and it used to have a very important rôle in relation to aeroplanes.

THE LECTURER: Pyrethrum is non-toxic to human beings, it has a rapid knock-down and it tends to decompose in oxygen and sunlight. It has a certain residual

action, as for example in a warehouse, where the conditions are dark, and there is not so much movement of air. Experiments are being made now in Kenya (in fact I saw one of them in progress recently) in order to ascertain whether water-miscible pyrethrum concentrates can be applied in spray-races for the control of the boophilus tick on cattle.

In general, however, I feel that it would be a waste of pyrethrum to add it to the type of product containing synthetic insecticides, which are formulated for applying residual treatment against mosquitoes. The main use of pyrethrum in malaria-control programmes is as a space spray.

So far as I am aware, Sir, patchouli oil has no synergistic properties, but I shall refer your suggestion to our laboratories in Nakuru.

MR. PERCY ARNOLD (Editor, *Commonwealth Development*): Mr. Chairman, in opening this meeting you referred to the fact that pyrethrum was an important Commonwealth product. I read recently that we are encouraging African farmers to grow pyrethrum. Because of the great importance of economic stability in Kenya does Dr. West know of any steps being taken, or can he indicate any steps that might be taken, to encourage the use of pyrethrum as an insecticide in this country?

THE LECTURER: That is a difficult question to answer. There are a number of commercial companies actively involved in selling pyrethrum insecticides and extending the use—in particular, of aerosols. As far as I know Government action is not being taken, but I believe there is a matter of £5 million available, which I think was set aside to further the produce of Africa in this country and throughout the world—to promote the development of African agriculture. Whether any of that will be devoted to the pyrethrum industry, I am afraid I cannot tell you. In this connection reference could be made to the booklet by R. J. M. Swynnerton, *A Plan to Intensify the Development of African Agriculture in Kenya* (1954). Pyrethrum is a convenient crop on small areas; it is highly priced and the return on capital outlay is rapid. Successful cultivation requires a good deal of actual manual work in, for instance, weeding and picking. This is an aid in providing employment in the Colony.

THE CHAIRMAN: Dr. West, suppose you hydrogenate the pyrethrins—are they still active? If so, you will increase the stability, I am certain of that.

THE LECTURER: Your suggestion is correct, Sir—hydrogenation does give more stable molecules, but unfortunately much of the insecticidal activity of the original pyrethrins disappears.

I should like to mention, before the discussion closes, that I gave a rather sketchy account of the Rothamsted work, I am afraid, because in the limited time at my disposal I could only do justice to the main subject. Perhaps Dr. Martin will say something to make up for these omissions?

DR. J. T. MARTIN: May I say how very sorry I am (and here I voice, I am sure, the feeling of you all) that Dr. Tattersfield is not with us to-day. Dr. West has fittingly paid tribute to the pioneers in the development of pyrethrum and I should like to add my own. Tattersfield, Fryer and Gimingham formed an excellent team to which the pyrethrum industry and indeed crop protection in this country owe much. When I entered the department at Rothamsted there was a sense of great emergency about the work on pyrethrum. The number of insecticides available at that time was extremely limited. Nicotine and lead arsenate were outstanding ones, and in the early days of the research the current recommendation for the control of serious pests such as the raspberry beetle was three applications of lead arsenate, each of four pounds per hundred gallons of diluted wash. The Ministry of Agriculture was extremely worried at that time about the danger of using lead arsenate, particularly to bees.

If you look back at the history of the development of the modern era in insecticidal

research in this country I think most of you will agree that it stemmed from the work of Gimingham. As early as 1912 he collaborated with Barker at Long Ashton in an investigation of the mechanism of action of Bordeaux Mixture. Later he joined Tattersfield at Rothamsted and they began a very fruitful collaboration on the effects of structure of organic compounds upon insecticidal action in addition to the work on pyrethrum and derris. Arising from this work I would draw your attention to two factors that I believe were of the greatest importance in developing the early work on insecticides and in setting the pattern for future research. The first was the making by Tattersfield and Morris in 1924 of a spraying apparatus for testing insecticides in the laboratory. The next development of great significance was Tattersfield's collaboration with C. I. Bliss from the United States, who came to work at Rothamsted with R. A. Fisher on the statistical evaluation of insecticidal action. Bliss, in developing his probit method, used much of Tattersfield's data. This method, as you know, has since been used to a great extent in biological research, including the medical field.

The work on pyrethrum at Rothamsted in the early days was a peculiar mixture, extending from chemical work on the isolation of the pyrethrins, the assessment of their relative activities and their determination in the flowers to field work at Woburn in Bedfordshire on the effects of manuring on flower yield and quality. Tattersfield's acid method of analysis, devised in collaboration with R. P. Hobson and Gimingham, opened the way to the many investigations described by Dr. West. All this time, Gimingham was keeping accurate records of the field trials we had under way. Often the revenue hardly met the cost of production, and for this reason Fryer looked for alternative regions for developing the crop overseas.

The question has been raised of the position of pyrethrum in horticultural research. The overall plan in the early days was that Rothamsted should do the chemical work on pyrethrum, the Plant Pathology Laboratory at Harpenden should carry out the field experimentation side, particularly in relation to the economics of growing the plant in this country, and that the research stations such as East Malling and Long Ashton should concentrate on the effect of pyrethrum upon pests in the field. Tutin at Long Ashton and Hobson at Rothamsted investigated suitable emulsion formulations and Kearns in 1933 experimented with concentrate spraying against the raspberry beetle. Some pests, e.g., the hop red spider mite, pear slug-worm and gooseberry sawfly, were well controlled, but the results with some others were disappointing. The effect too often was an immediate knock-down, with a tendency for the pests to recover, and it was then that derris, also promoted by Fryer and worked on by Tattersfield, stepped into the breach and became the usual remedy for pests of soft fruits.

My feeling with regard to both pyrethrum and derris is that these materials never had a real chance to show what they could do. Standardization and formulation were not nearly so advanced as now, and application machinery was not so efficient. On the question of mixed insecticides, it should be possible to make use of the irritating action of pyrethrum on insects in turning them out of buds and curled leaves, leaving some more slowly-acting poison to complete the control.

THE CHAIRMAN: It only remains for me on your behalf as well as my own to express to Dr. West our deep thanks for his most interesting and informative paper, which I am certain will give many of us much food for thought for a long time to come.

*The vote of thanks to the Lecturer was carried with acclamation and, another having been accorded to the Chairman upon the proposal of Sir Selwyn Selwyn-Clarke, the meeting then ended.*

# GENERAL NOTES

## THE FUTURE OF THE REGENT'S PARK TERRACES

In November, 1957, the Crown Estate Commissioners published a statement on *The Future of the Regent's Park Terraces* in which it was announced that Cumberland Terrace, Park Square East and West, Park Crescent, York Gate, Hanover Terrace and Kent Terrace were to be preserved. Since the Symposium printed on pages 387–404 of this *Journal* was held, the Commissioners have issued a second statement under the same title (H.M.S.O., price 9*d*.). In this they disclose plans under consideration for the early redevelopment of further Regency Terraces in the Park, and announce the grant of a reprieve to the Victorian Cambridge Gate, which was to have been demolished as soon as possession could be obtained, but will now remain as it is until at least 1976.

The only Nash buildings at present marked down for demolition (in accordance with recommendations made in 1947 by the Gorell Committee) are Someries House, where the Royal College of Physicians propose to build a new headquarters, and Cambridge Terrace. London University have indicated that they are interested in redeveloping the site of the latter as a hostel for students. A design for this purpose by Professor Robert Matthew, F.R.I.B.A., includes one feature—a tower 14 stories high—which, inasmuch as it would dominate the skyline, is likely to cause argument. The outline plan of this scheme, however, has yet to be discussed with the London County Council and the Royal Fine Art Commission.

An agreement is being negotiated with a private developer for the structural repair of all the houses in Chester Terrace, and their adaptation as homes suitable to present-day conditions. The eight unoccupied houses in the east segment of Park Crescent are to be modernized behind the original façade, whilst the bombed portion in the west Crescent is to be rebuilt and the Nash façade copied. The final plans by Mr. Louis de Soissons for the rehabilitation of Cumberland Terrace provide for the retention of 12 houses and the conversion of the others into flats. In this connection the statement notes that structural engineers employed by the Commissioners 'pay tribute to the effectiveness of the repairs and strengthening carried out by the Ministry of Works when the Terrace was occupied by them'.

Of the other main Terraces, York Gate will be preserved *in toto*, as already stated, and it is hoped to arrange with a private developer for the houses in Clarence Terrace to be modernized. At a later stage the whole of Gloucester Gate, Cornwall Terrace and Sussex Place will probably be converted into flats.

In sum, this new statement is to be welcomed as revealing the progress made by the Commissioners during the last sixteen months towards the fulfilment of their declared objectives: 'First, to preserve the façades and return frontages of the Regency Terraces while ensuring that the reconstructed buildings have a life of at least 60 years. Secondly, to restore to residential use the Terrace houses facing the Park which are at present occupied as Government offices.'

## A WELL-EARNED PREMIUM

The judgement of the Royal Society of Arts two hundred and two years ago was recently confirmed at Sotheby's Auction Room in Bond Street. The occasion was the sale of a magnificent carpet (the property of the Earl of Shrewsbury) from the Yellow Drawing-Room at Ingestre Hall, Staffordshire. The carpet, like another of the same pattern and size at Syon House, Middlesex, was designed by Robert Adam, whose drawings for it are still in existence. It was woven about 1770 by Thomas Moore, of Chiswell Street, Moorfields, London, who received £57 12*s*. for the work.

Thomas Moore was one of the first two carpet-weavers to receive an award from the Society of Arts. In 1756 two premiums, of £30 and £20 respectively, were offered

by the Society as a means of stimulating the manufacture of hand-knotted carpets in England. A specimen of his work (measuring 16 ft. × 12½ ft.) submitted by Moore in the following year was adjudged to be 'in many respects equal, and in some respects superior, to those imported from Persia and Turkey', and he received a half share of the total prize money, the other £25 being awarded to Thomas Whitty of Axminster. Though the Chiswell Street factory had been established some time before 1757, it was only operating in a small way at this date, and there is no doubt that the encouragement Moore received from this award, and the notice bestowed upon his work, helped to set him on the road to fashionable success. Apart from Ingestre and Syon, he is known to have collaborated with Robert Adam in executing commissions for a number of other great houses, notably Osterley and Saltram.

At the recent auction, the highest bid was £12,500, at which the Ingestre carpet was withdrawn. It is noted in the sale catalogue as having 'three rectangular panels divided by a turquoise and white Greek-key border, a band of sepia and brown *guilloches*, a wide dove-grey border woven with pink and gold scrolling and honeysuckle motifs and an outer border of pink beads shaded with white. . . .' *The Dictionary of English Furniture* described the carpet as 'the nearest approach to perfection in contemporary design'.

G. S. S.

DESIGN IN THE SOUVENIRS INDUSTRY

In an effort to encourage higher design standards in the British souvenirs industry, the Council of Industrial Design is opening a category in Design Index for souvenir gifts in current production which have been designed specifically as mementoes of places.

Last year the Design and Research Centre for the Gold, Silver and Jewellery industries and the C.o.I.D. decided to arrange a display of well-designed souvenirs in the Design Centre. In both quality and quantity the submissions fell far below expectation, and souvenirs from only four manufacturers were exhibited. Talks have since taken place between Mr. Elkan Simons, Chairman of the Design and Research Centre, Mr. L. J. Lickorish, Deputy Director-General of the British Travel and Holidays Association, and Sir Gordon Russell, Director of the C.o.I.D., to see what improvements could be made; and they have discussed the situation with a group of leading manufacturers.

It was agreed that souvenirs in European countries were improving in appearance, and that these will both serve and create a more discriminating public. In the next few years there is likely to be a growing demand for something better as a souvenir of a happy holiday, or as evidence of travel in the British Isles.

The decision to open a Design Index category for articles of such a nature is regarded as a first step towards satisfying this demand. Manufacturers will also be encouraged to qualify for the Design Centre label and, possibly, for a certificate issued by the British Travel and Holidays Association.

Manufacturers wishing to submit their products to the Design Index Committee should write to the Chief Industrial Officer, Council of Industrial Design, 28 Haymarket, London, S.W.1.

CONFERENCE ON 'QUALITY IN INDUSTRY'

The Institution of Production Engineers, the Institution of Engineering Inspection and the British Productivity Council are jointly organizing a conference to examine from various points of view the many problems involved in establishing and maintaining 'Quality in Industry'. This is to be held at the Palace Hotel, Buxton, on 18th and 19th June. The conference fee will be five guineas, inclusive of light refreshments and conference papers. Those wishing to attend may obtain details of the programme and application forms from the Conference Secretary, The Institution of Production Engineers, 10 Chesterfield Street, London, W.1.

ROYAL DRAWING SOCIETY'S ANNUAL EXHIBITION

The Royal Drawing Society's 64th annual exhibition is on view at the Guildhall Art Gallery until 2nd May. Generally known as 'The Children's Royal Academy', the exhibition, admission to which is free, consists of some 200 paintings by young people between the ages of 3 and 17. After leaving London the pictures will be shown in the following centres: Wolverhampton (Art Gallery, 2nd June to 4th July); Worthing (Art Gallery, 5th September to 3rd October); Birkenhead (Williamson Art Gallery, 20th October to 1st November); Bath (Victoria Art Gallery, 5th to 26th March, 1960); and Bristol (City Art Gallery, 11th April to 2nd May, 1960).

REYNOLDS STONE EXHIBITION

The Arts Council is now holding a small exhibition of the work of Reynolds Stone, R.D.I., one of the most distinguished living wood-engravers and designers of book-plates, carved inscriptions and heraldic devices. The exhibition is on view at 4 St. James's Square, S.W.1, until 9th May at the following times: Mondays, Wednesdays, Fridays, Saturdays, 10 a.m. to 6 p.m.; Tuesdays, Thursdays, 10 a.m. to 8 p.m. Admission costs one shilling.

## *OBITUARY*

We record with regret the deaths of the following Fellows of the Society.

DR. W. R. G. ATKINS

Dr. W. R. G. Atkins, C.B.E., M.A., Sc.D., F.R.S., F.R.I.C., for many years head of the Department of General Physiology at the Marine Biological Association's Plymouth Laboratory, died on 3rd April, aged 74.

William Ringrose Gelston Atkins was educated at Cork Grammar School and Trinity College, Dublin, where he had a distinguished career as a student—he took senior moderatorships in experimental and natural science—and as assistant, first to the Professor of Chemistry and then to the Professor of Botany.

During the First World War he served in the Royal Flying Corps, and was given charge of the experimental aircraft depot in Egypt. After a short period in India as indigo research botanist at the Imperial College of Agriculture, he was appointed in 1921 to the Plymouth laboratory where, except for two years in the Meteorological Office of the Air Ministry during the recent war, the rest of his working life was spent. He had been made O.B.E. in 1919, and was advanced to C.B.E. in 1951.

Atkins, who was the author of *Recent Researches in Plant Physiology* and many papers published in learned journals over the years, was elected a Fellow of the Royal Society in 1925. In 1928 he was awarded the Boyle Medal of the Royal Dublin Society. He became a Life Fellow of the Royal Society of Arts in 1950.

MR. J. H. O. BUNGE

Mr. Julius Hendrik Otto Bunge, M.I.M.M., the engineer who during the 1930s became identified with an interesting scheme for making the Thames a tideless river, died on 9th April, aged 82. He was born and educated in the Netherlands, and worked for some years in the United States before being appointed technical director of the Leerdam Glassworks in South Holland, a post which he held until 1918. He settled in England in 1919, and during the next decade was occupied in industry in this country. From 1932 onwards, however, he gave all his time to the furtherance of plans for a Thames barrage, proving himself to be an indefatigable and persuasive advocate in this cause.

The argument in favour of damming the Thames at a suitable point has a long

history and some unexpected supporters, including Hubert Spencer in the nineteenth century. Bunge's plan was a modification of a proposal put forward by Thomas Barber in 1904, and envisaged the construction of a barrage just above the sewage outfalls in Barking, and just above the entry to the Royal Docks.

Bunge described the general advantages to be derived from this idea in a paper on 'The Thames Barrage Scheme and Its Importance in the London Reconstruction Plans', which he (speaking on behalf of the Thames Barrage Association) read to the Society in March, 1945: it would keep the sewage out of London; it would result in 'a river which can serve as a two-way traffic lane all the time'; and it would rid London's riverside of the ugly and offensive mud banks which appear twice a day. This paper and his book, *Tideless Thames in Future London* (1944), leave no doubt that Bunge's knowledge of the project was as deep as his conviction of its necessity. He won many supporters.

Mr. Bunge had been a Fellow of this Society since 1919. He became a British subject in 1929.

### MR. LAWRENCE DALE

Mr. Lawrence Dale, F.R.I.B.A., who died on 29th March, aged 75, had for many years practised as an architect in Oxford, where he was also diocesan surveyor. He designed Horn Park, Dorset, Goddards Green, Cranbrook, and a number of smaller houses at Hampstead.

Dale was the proponent of an interesting and cogently argued solution to the problem of Oxford's traffic congestion. In 1941, in a pamphlet entitled *Christ Church Mall: a diversion*, he suggested the construction of a road to run from the bottom of Headington Hill to the stations, *via* the southern perimeter of Christ Church Meadow; the three streams of vehicles which converge at the foot of the hill would be carried across the Cherwell by a new bridge, and Magdalen Bridge would be relieved of all those motorists who had no wish to go through the city centre. *Towards a Plan for Oxford City*, which Dale published in 1944, developed this idea and showed, through the medium of his own skilful water-colour paintings, that he had visualized this Christ Church Mall to be something comely as well as necessary and useful.

Mr. Dale was elected a Fellow of this Society in 1947.

### SIR GORDON ROLPH

Sir Gordon Burns Rolph, C.M.G., O.B.E., governing director of W. R. Rolph & Sons Ltd., proprietors of the Tasmanian *Examiner* and *Saturday Evening Express*, died at Launceston, Tasmania, on 23rd March, aged 66. Rolph was chairman of several important business companies in Tasmania, but it was through his newspaper interests that he came to be well known in the Commonwealth at large. He served as a delegate to four meetings of the Imperial Press Conference: twice in London (1930 and 1946), in Canada (1950), and in Australia (1955). He was a member of the Commonwealth Newsprint Pool Committee from 1939–49, and from 1942–51 President of the Australian Provincial Press Association.

Rolph will also be remembered for his many services to Launceston, his native city. He had been President of its Chamber of Commerce, a member of the Launceston Hospital Board, and a Vice-President of the Society for Crippled Children. He gave much help and encouragement to local work for the welfare of young people. An enthusiastic motorist, he was Foundation President, and later Patron, of the Royal Autocar Club of Tasmania.

Sir Gordon Rolph was elected a Life Fellow of the Society in 1955.

## *NOTES ON BOOKS*

THE CULTURAL FOUNDATIONS OF INDUSTRIAL CIVILIZATION. *By John U. Nef. Cambridge University Press*, 1958. 20*s net*

This work is based on Professor Nef's Wiles Lectures given in the Queen's University, Belfast, in 1956 under what he gratefully describes as 'the generous terms of the Wiles Trust', which enable the lecturer to offer to his audience an account of historical work actually in progress but not yet completed. That he should turn to the subject indicated in the title is only to be expected when we recall his classic two-volume study of a quarter of a century ago on *The Rise of the British Coal Industry*. Here, however, he now concerns himself not with economic history, but with the wider milieu in which our industrial civilization had its first beginnings four hundred years ago.

In opening his discussion, Professor Nef considers the movements of the mind at the time of these first beginnings (*c.* 1570–*c.* 1660). Wisely he urges his readers not to carry into that dawn the easy explanation of development arising from considerations of utility, but to recall the tendency of that age to quantitative precision and quantitative data, while not forgetting the human fabric that always and inevitably lies beneath the tabulated statistics and data on this or that or the other. The origins of our modern industrial civilization are to be studied for their full appreciation, he maintains, through more eyes than those of the economic historian and the statistician, and we should consider the wider historical background of faith and ethics and art in which our modern world began its course—the modern world of industrialism that was created by the human spirit and which has now, by the triumph of that industrialism, imperilled the survival of the very spirit that brought it into being.

The quantitative data assembled by modern scholars stresses the sixteenth and seventeenth centuries as marked by commercial revolution, price revolution and industrial revolution, but such statistics obscure the factors that generated these changes. The influence of the Renaissance in art and architecture led to a multiplication of fine commodities for purposes neither necessarily economic nor aimed at the satisfaction of the needs of any great number of persons. With the Reformation, the monastic lands in England changed into the hands of owners inspired by motives economically different from those of their former possessors and bent on the exploitation of their newly won acquisitions. In the late sixteenth and early seventeenth centuries, especially in Great Britain, there was a significant and novel change towards the production of cheap commodities in large quantities and it was thus that there arose the explanation of expansion in terms of utility. It was, however, the rise of modern science with its application to practical ends that later provided the mainspring for advancing industrialism, to solve the increasing technical problems of which empirical search had proved inadequate.

Turning back, however, to consider other factors, we can detect in the changing attitude to the cruelties and atrocities of war the coming of what we call 'civilization' early in the four centuries of modern science. This influence of human personality on the course of history was derived from the realms of faith and art rather than from those of economics and natural science. In the first half of the sixteenth century Erasmus and those who followed him emphasized Christian responsibility for the temporal world and taught the practice of Christian charity. At this time, too, it was seen that it was possible to combine the highest ethical ideas with the delights of secular art. Here we have the spiritual bases of civilization. There was also an aesthetic basis, a union of the sacred and the beautiful. It is in this matrix that we are asked to consider the distant origins of that industrial change that ultimately remoulded our world.

This most stimulating book on studies still in progress can be recommended to all interested in the cultural origins of our modern industrial civilization.

DOUGLAS MCKIE

PICASSO: HIS LIFE AND WORK. *By Roland Penrose. London, Gollancz, 1958. 25s net*

The daunting problem of portraying, at all credibly, a fictitious artist of genius—more especially in a play—is well known. In theory, a non-fictional biography should be a much easier task, since readers will come prepared to recognize a known genius, and find mastery confirmed in any reproductions of his work. These advantages Mr. Roland Penrose, of course, possessed in compiling his critical biography of his friend Pablo Picasso, illustrated with a large number of small monochrome reproductions showing every phase of the master's career. At the same time, no task could have been more complex, seeing that Picasso's talk commonly runs to paradox, that his aesthetic ideas may almost defy rational interpretation, and that his successive loves require of the narrator the most delicate feeling and understanding.

That Mr. Penrose has produced, notwithstanding, one of the fullest and most satisfying biographies of modern times, so authoritative in all its detail as to render obsolete a number of previous studies of Picasso, is due as much to the author's understanding of the creative process as to his entrée to the painter's studio, and the skill with which he can draw his hero out. An occasion comes to mind when this reviewer discovered for himself the gentle persuasiveness of Mr. Penrose's advocacy. In a three-cornered conversation, a few years ago, Professor Alan Clutton-Brock vehemently urged the view that Rembrandt's great masterpiece, *The Night Watch*, exacted far more from the artist than any offspring of Picasso's fertile inventiveness. That opinion this writer upheld with almost equal warmth. Very soothingly, yet without yielding an inch, Roland Penrose argued that Picasso's *Guernica* was a masterpiece no less demanding of genius.

What the author now says in his book exemplifies his manner, alike in speech and writing, of making his points very simply and cogently, and without ever raising his voice. 'It is the simplicity of *Guernica*', he tells us, 'that makes it a picture which can be readily understood. The forms are divested of all complications which would detract from their meaning. The flames that rise from the burning house and flicker on the dress of the falling woman are described by signs as unmistakable as those used by primitive artists. The nail-studded hoof, the hand with deeply furrowed palm, and the sun illuminated with an electric light bulb, are drawn with a child-like simplicity, startling in its directness. In this canvas Picasso had rediscovered a candour of expression which had been lost, or overlaid for centuries with the refinements of artistic skill. He had proved such excellencies to be unnecessary, even a hindrance to an understanding of reality.'

There, of course, is the clue to much of Picasso's later painting. The succession of surprises he has sprung on the world of art can all be explained, though never has his purpose been made clearer than in these patient, unemphatic chapters. It is a virtue of the author's method that he continually stresses the interplay of Picasso's life and art which is, indeed, essential to a proper understanding. He reminds us that even in the Cubist period, when the painter was dissecting form with a rigour that rendered normal appearances barely recognizable, he still required the frequent presence of the sitter. A model named Fanny Tellier at length lost patience, and it is well she did, for the Cubist portrait of her, *Girl with Mandoline*, 1910, has a serenity of poise which any further transfiguration might have lost. His Cubist picture inspired by Marcelle Humbert, entitled *Ma Jolie*, is certainly carried to a stage when it ceases to be a portrait in any accepted sense.

What emerges from these pages (though not explicitly stated) is the remarkable fact that alone in our time, and without exact parallel, indeed, in any other, Picasso can convey the entire gamut of emotions from the agony of *Guernica* to the mischief

of his laughing Lee Miller. A whole series of studies of his children with their toys bespeaks his playfulness even if the humour is obliquely conveyed through the wry distortions. Rather, his humour is implicit in the gay colours and liveliness of invention. For while the nobility, or pathos, or ruthlessness of Picasso's images is transmitted with unmistakable directness, he equates humour with mocking paradox.

What will be the ultimate reputation of this *stupor mundi*, no one can say. When the mercurial figure has faded from this world, a disembodied grin will continue to float, one may surmise, to give endless speculation for generations to come. Meanwhile, this hardy veteran is very much alive, working with unquenchable zest and vitality on his transfigurations of Velasquez's *Las Meninas* in his top-floor studio of his villa at Cannes. Occasionally intruders who manage to penetrate the defences of the front gate are well received by the master, whose black eyes (decides Mr. Penrose, permitting himself for once a fanciful flight of his own) 'have stirred their emotions like a red-hot poker sizzling in a pot of mulled wine'. But no doubt Picasso's independence impresses visitors even more. 'It is art itself,' said Molière, 'that should teach us to free ourselves from the rules of art.' Mr. Penrose is right in deciding that the art of Picasso, unaided by theories, has done just that.

NEVILE WALLIS

THE FACE OF EARLY CANADA. PICTURES OF CANADA WHICH HAVE HELPED TO MAKE HISTORY. *By F. St. George Spendlove. Toronto, Ryerson Press*, 1958. $8.50

Mr. St. George Spendlove has done a great service in bringing together for the first time so much useful and essential information on what are, in his view, the more important and characteristic prints of pictures of early Canada. Both collector and historian will value the details about artists, engravers, methods of reproduction, numbers of editions, and other facts which, together with commentaries on the techniques used by the various artists whose work is represented, have been assembled to make an interesting and useful book of reference. Six reproductions in colour and one hundred and twenty-two in black and white of originals and prints in the Sigmund Samuel Gallery in Toronto add greatly to the attractiveness of a finely produced book.

The period covered is from 1556 through the French and British régimes to Confederation in 1867. At the end of that time the Arctic coast had been delineated and explorer-fur traders had unrolled the map westwards across to the Pacific. But though historically the time element shortens as we move away from the eastern seaboard and the St. Lawrence, the book is chiefly concerned with the earliest parts of Canada explored and colonized by French and English. Inevitably, therefore, St. Lawrence Valley subjects (with Quebec and Montreal in the lead) tend to predominate.

The earliest pictures were, for the most part, the work of artists from Europe, and the earliest mentioned are those which decorate the first maps of North America, maps which themselves are almost as quaint and fanciful as the scenes which embellish them. As pictorial records, therefore, these scenes are not of much use, though the Herman Moll picture of beavers at work on the 1711 map (referred to only) does at least serve as a reminder of the important part played by these animals in the economy and in the history of North America.

Although the French régime in Canada lasted about two hundred years and was documented by explorer-fur traders and indefatigable missionaries, pictorially it is a lean one. But after the British conquest there came a marked change, and the author has made generous acknowledgement to the British Army officers who have left a wealth of pictorial material.

These British Army officers had been taught water-colour sketching as part of their training at the Royal Military Academy, Woolwich, and the work of some of them shows the influence of Paul Sandby, R.A., who taught there for many years. These soldier-artists, in the course of duty or for their own pleasure and amusement,

sketched in pencil, water-colour, and other media, scenes in towns and surrounding countryside, both in summer and in winter. They did not, perhaps, attain the highest professional standards artistically—after all, they were soldiers first—but some achieved a skill of average high quality, and since they portrayed their subjects with near exactitude they have left the historian some valuable pictorial material.

Besides the soldier artists, the works of such professionals as Coke-Smyth, George Cooke and W. H. Bartlett, among others, are represented in the text and among the reproductions. Cornelius Kreighoff, as might be expected since his name becomes news when his pictures change hands, is given a chapter to himself, and of the six reproductions in colour included in this book, two are of his pictures. These two pictures support the author's vigorous defence of Kreighoff's best work against the criticism of those who are more concerned with technical values than in the interest which even his 'pot boilers' have for those of us looking for lively pictures of the *habitan's* past way of life.

The areas well beyond the Maritimes and 'old' Canada come under 'Minor Themes' and are dealt with so briefly that it is all the more disappointing that people and not scenes represent the Arctic among the reproductions. It is also disappointing that the Warre pictures represent scenes below the Forty-ninth Parallel, but these faults can be remedied if Mr. St. George Spendlove will make the area beyond 'old' Canada the major theme of another book.

ALICE M. JOHNSON

## *SHORT NOTES ON OTHER BOOKS*

ELECTRONS AT WORK. *By F. J. M. Laver. London, O.U.P.*, 1958. *7s 6d net*

A companion volume to the same author's *Electric Power* (see *Journal*, 27th September, 1957, p. 894), this provides a simple and reliable introduction to the uses of electricity for telecommunications and electronics.

GALLERY OF PENCIL TECHNIQUES. *By Ernest Watson. New York, Reinhold*, 1958. (*London, Chapman and Hall, 40s net.*)

Twenty-four plates, of subjects requiring appreciably different treatment, chosen to illustrate some of Mr. Watson's best work. Each plate is accompanied by descriptive notes analysing particular problems of technique and presentation.

RIOT IN EPHESUS. *Writings on the Heritage of Greece. By Charles Seltman. London, Max Parrish*, 1958. *21s net*

These posthumously collected essays, which first appeared in the *Cornhill* and *History To-day*, are an apt reminder that the late Dr. Seltman's classical studies ranged well beyond his special subject of numismatics. They demonstrate two of his gifts in particular: the power to illumine seemingly abstruse subjects for the benefit of the non-specialist, and a style that approaches the conversational in its flexibility and variety of tone.

## *FROM THE JOURNAL OF 1859*

VOLUME VII. *13th May*, 1859

CONVERSAZIONE

The first Conversazione of the present Session was held on Saturday evening last, at the Society's House. The whole of the rooms were thrown open, and in the Great Room was arranged a series of busts and statuettes of the Crimean and Indian heroes, by Mr. Matthew Noble and Mr. G. G. Adams; also a modelled design for a monument to the memory of the Duke of Wellington, by Mr. John Bell. On the tables were displayed a large variety of models and specimens, including Mr. Henry Maudslay's glass turned in the lathe, glass screws, and geometric figures turned

upon glass. Mr. Warren De la Rue's stereoscopic views of the moon, and those by Mr. Fry, were exhibited, as well as that gentleman's stereoscopic views of waves of the sea. Mr. Ladd attended and exhibited some microscopic specimens of photography, by means of some of his powerful instruments. The series of chromolithographs recently prepared for the Arundel Society, being copies of some of the Florentine Frescoes, as well as some of their more recent fictile ivories, were lent for the occasion. The improved oxy-hydrogen light of Mr. James Copcutt was exhibited by the Hon. Major Fitzmaurice, as well as his improved gas, which was shown in action by means of a portable lamp. Messrs. Wilson Newton and Co., and Mr. Thomas, attended and showed their improved stitching machines; and Mr. Clarkson explained the peculiarities of his combination of cork and canvas, and illustrated its capabilities for constructing articles of dress, as also its strength, lightness, and suitability for life-boats and life-buoys.

Mr. Bestall explained his instrument for showing colour by polarized light; and Mr. Bennett Woodcroft contributed some singularly beautiful specimens of tempered steel from the Museum of the Commissioners of Patents.

In the committee and adjoining rooms were exhibited specimens of painting on mirrors, by Signor Agneni; the new water gas light by M. Gillard, as also Mr. Clibran's arrangements for lighting and regulating street gas lamps. Messrs. Murray and Heath exhibited their new electro-magnetic engine, and Mr. Henry Johnson's deep-sea pressure gauge and volutor were described and worked. The Preserved Fresh Meat Company sent some specimens of meat cured by their process in February last. Messrs. Powell exhibited specimens of photographs applied in the decoration of glass vases. Professor Tennant forwarded the first gold nugget imported from Australia into this country in 1851, and a model of the largest specimen received up to the close of the year 1858. Many other interesting specimens and models were shown. . . .

The collection of the patented inventions of the last twelve months, arranged in the lower rooms, was thrown open, and many of the patentees attended and explained their models in action.

The collection was retained for the inspection of members and their friends during the whole of Monday. . . .

## *Some Activities of Other Societies and Organizations*

### MEETINGS

MON. 27 APRIL. Geographical Society, Royal, at 1 Kensington Gore, S.W.7. 5 p.m. E. M. Yates: *History in a map.*

Public Health Engineers, Institution of, at Conference Room, Hotel Majestic, Harrogate. 5.30 p.m. A. E. J. Pettet, J. G. Tomlinson, and J. Hemens: *The treatment of strong organic wastes by anaerobic digestion.*

TUES. 28 APRIL. Analytical Chemistry, Society for, at the Brunel College of Technology, Woodlands Avenue, Acton, London, W.3. 6.30–9 p.m. *A demonstration of laboratory-made equipment.*

International Affairs, Royal Institute of, at Chatham House, 10 St. James's Square, S.W.1. 8 p.m. R. H. S. Crossman: *German opinion and the Berlin crisis.*

WED. 29 APRIL. Royal Institution of Great Britain, at 21 Albemarle Street, W.1. 9 p.m. G. de Q. Robin: *Antarctic.*

SAT. 2 MAY. Interplanetary Society, British, at Tudor Room, Caxton Hall, S.W.1. 6 p.m. D. J. Cashmore: *Inertial guidance and its application to astronautics.*

TUES. 5 MAY. Radio Engineers, British Institution of, at London School of Hygiene & Tropical Medicine, Keppel Street, Gower Street, W.C.1. 6.30 p.m. I. M. Ross, C. P. Lea-Wilson, A. J. Monk, and A. F. H. Thomson: *An experimental diode parametric amplifier and its properties.*

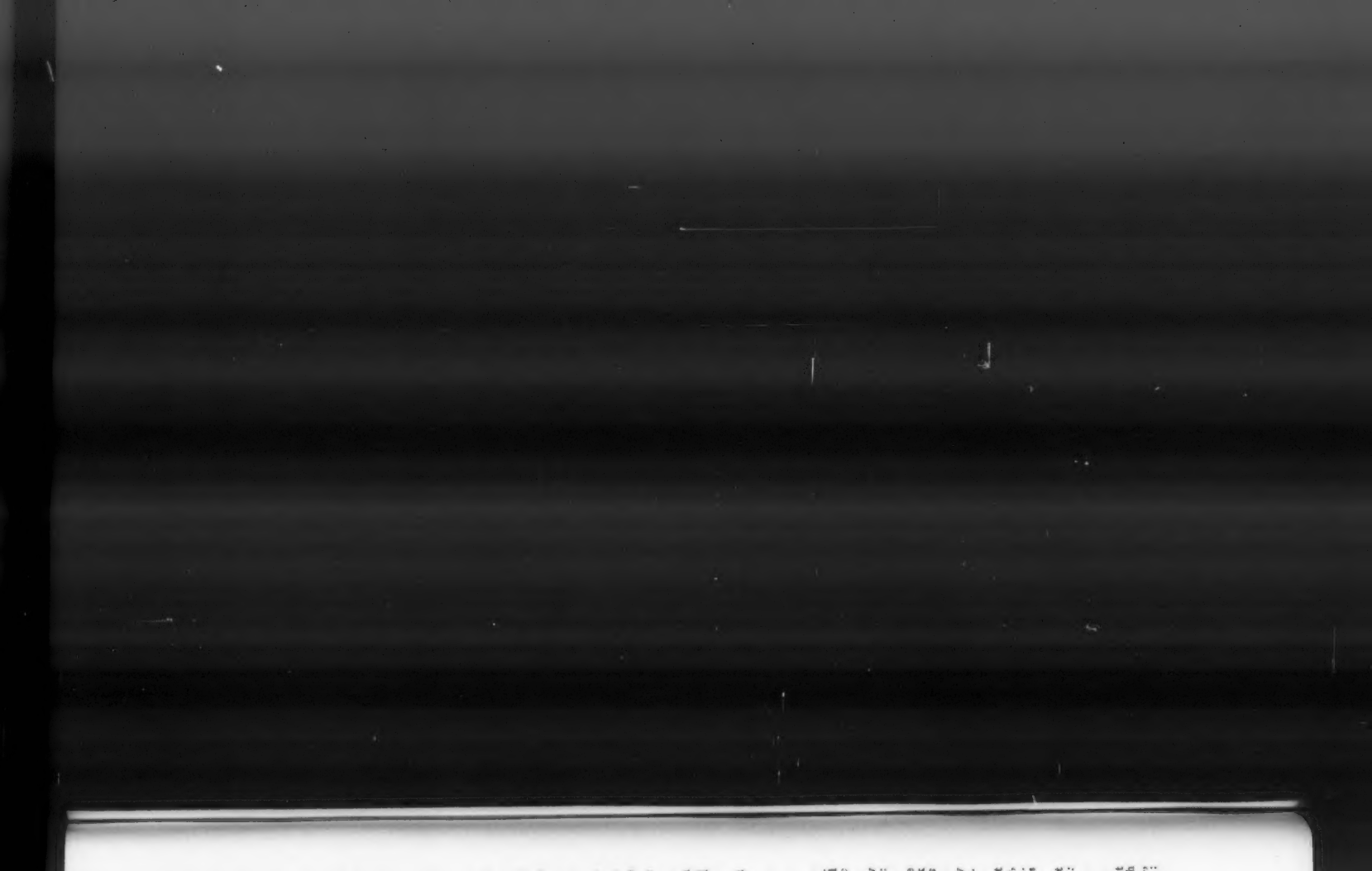
WED. 6 MAY. Petroleum, Institute of, at 61 New Cavendish Street, W.1. 5.30 p.m. Symposium: *Submarine exploration for oil.*

THURS. 7 MAY. Refrigeration, Institute of, at the Institute of Marine Engineers, the Memorial Building, 76 Mark Lane, E.C.3. 5.30 p.m. L. J. Clark: *Design problems in the storage and handling of liquid methane.*

TUES. 12 MAY. Chemical Engineering Group, at Society of Chemical Industry, 14 Belgrave Square, S.W.1. 6 p.m. W. Quick: *Fuel economy in chemical works.*

WED. 13 MAY. Radio Engineers, British Institution of, at London School of Hygiene & Tropical Medicine, Keppel Street, Gower Street, W.C.1. 6.30 p.m. Professor D. Gabor: *Improving communication techniques.*

FRI. 22 MAY. Architects, Royal Institute of British, at 66 Portland Place, W.1. 6.30 p.m. *The living town: a symposium on urban renewal.*

### OTHER ACTIVITIES

SAT. 11 APRIL–SAT. 2 MAY. Grabowski Gallery, at 84 Sloane Avenue, Chelsea, London, S.W.3, nr. South Kensington Station. Open daily 10 a.m.–6 p.m., except Sundays. T. Ilnicki, Phillip Woollard: *Paintings.*